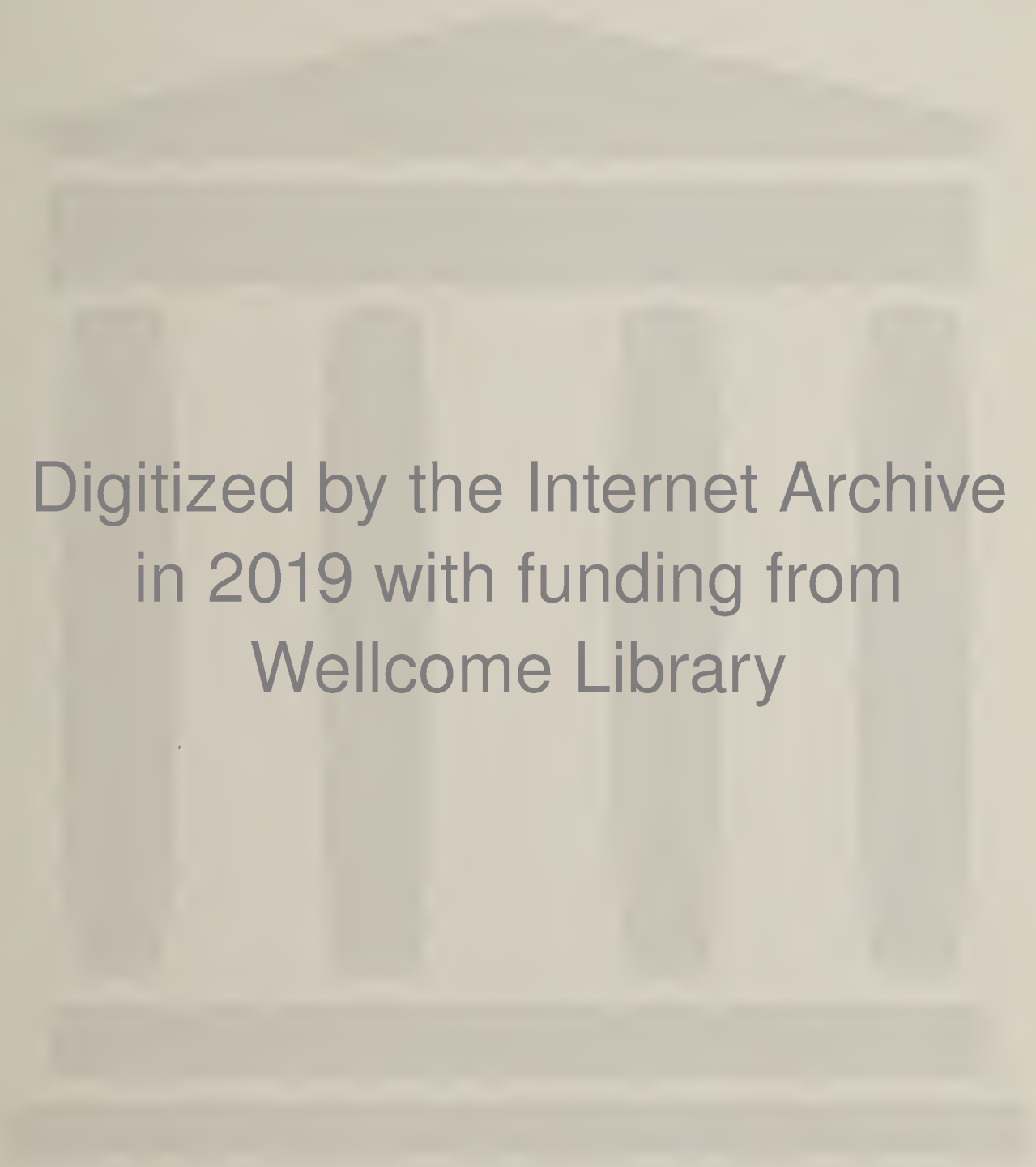


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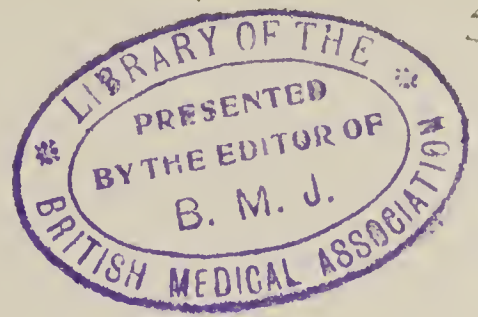
FIG. 1.—The Hospital of the Protestant Episcopal Church, Philadelphia

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HOSPITAL

OF

THE PROTESTANT EPISCOPAL CHURCH
IN PHILADELPHIA



MEDICAL AND SURGICAL REPORTS

OF THE

EPISCOPAL HOSPITAL

VOLUME IV

PHILADELPHIA
PRESS OF WM. J. DORNAN
1916

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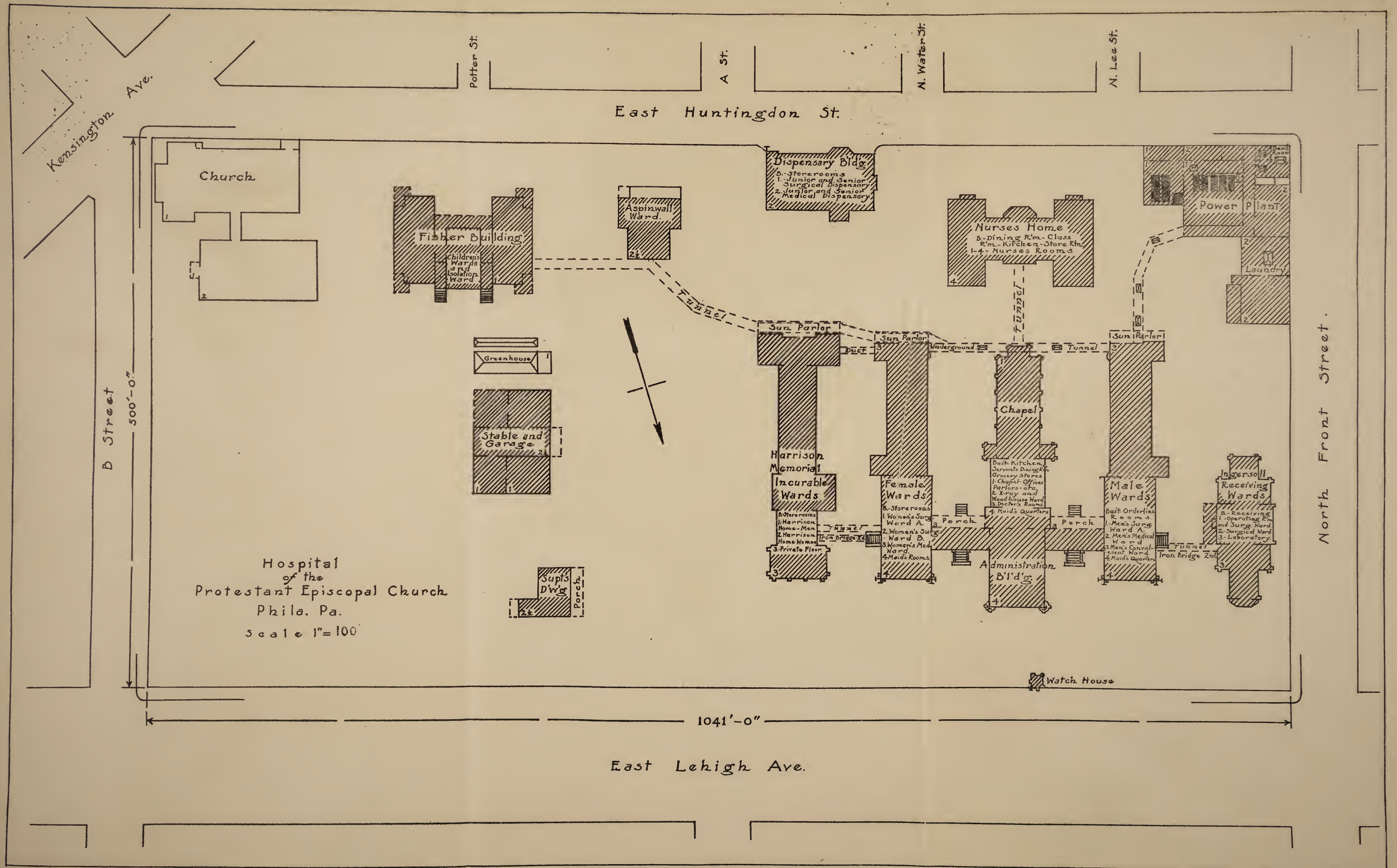
FRANCIS W. SINKLER, M.D.

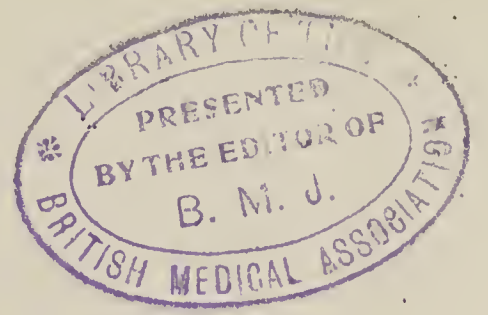
COURTLAND Y. WHITE, M.D.

ASTLEY P. C. ASHHURST, M.D., *Chairman.*

This volume has been edited by

ASTLEY P. C. ASHHURST, M.D.





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Consulting Ophthalmologist, DR. WILLIAM T. VAN PELT
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CHIEF NURSE AND DIRECTRESS OF THE TRAINING SCHOOL FOR NURSES

MISS KATHARINE BROWN, R.N.

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MARGARET VOGLESON

LIST OF EXCHANGES

- Buffalo General Hospital Reports. Buffalo, New York.
Bulletin de l'Académie Royal de Médecine de Belgique. Bruxelles, Belgium.
John Crerar Library Publications. Chicago, Illinois.
Crouse-Irving Hospital Bulletin. Syracuse, New York.
Johns Hopkins Hospital Bulletin. Baltimore, Maryland.
Massachusetts General Hospital, Collected Papers. Boston, Massachusetts.
Münchener medicinische Wochenschrift. Munich, Germany.
Philippine Journal of Science, Medical Section. Manilla, P. I.
Pilcher Hospital, Bulletin of the. Brooklyn, N. Y.
Presbyterian Hospital Reports. New York, N. Y.
Roosevelt Hospital, Medical and Surgical Reports. New York, N. Y.
Royal College of Surgeons of England, Calendar. London, England.
University of Missouri Bulletin, Medical Series. Columbia, Mo.
Westminster Hospital Reports. London, England.

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JOHN B. WOLFE, M.D.

Resident Physician in the Hospital.

PAPERS BASED ON WORK DONE IN THE EPISCOPAL HOSPITAL, 1915-1916

FROM THE MEDICAL DEPARTMENT OF THE HOSPITAL.

From Dr. Robertson's Service:

Robertson and Paul: Intravenous Protein Therapy.

Durham: Report of a Case of Pneumococcic Meningitis Treated by Intraspinal Injections of Formalin, with Recovery.

Procter: Report of a Case of Early Tabes Dorsalis.

From Dr. Sinkler's Service:

Sinkler and Wolfe: A Chart for Use in Cases of Artificially Fed Infants.

From Dr. Carson's Service.

Carson and Paul: Two Cases of Cerebrospinal Meningitis, with Recovery.

From Dr. Godfrey's Service.

Godfrey: Congenital Stenosis of the Pulmonary Artery.

FROM THE SURGICAL DEPARTMENT OF THE HOSPITAL.

From Dr. Deaver's Service.

Alexander: Gunshot Wound of the Carotid Artery; Death.

Boykin: Report of a Case of Purpura Hemorrhagica Mistaken for Appendicitis.

From Dr. Mutschler's Service.

Crossan: Cholelithiasis, with Multiple Gastric Hemorrhages; Cholecystostomy; Recovery.

Crossan: Inversion of the Uterus Reduced by Laparotomy; Recovery.

From Dr. Ashhurst's Service.

Ashhurst: Surgical Experiences with Encapsulated Empyema and Abscess of the Lung; a Plea for Exploratory Thoracotomy.

Ashhurst: Indications for the Iodoform Wax Bone-Filling of Mosetig-Moorhof.

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 Crossan: Torsion of the Great Omentum; Laparotomy; Recovery.
 Longaker: End-Results of Fractures of the Forearm.
 Whitaker: Iliac Abscess.

FROM THE OPHTHALMIC DEPARTMENT OF THE HOSPITAL.

From Dr. Krauss's Service.

Krauss: Bilateral Choked Disk following Thyroidectomy.
 Krauss: A Method for the Ligation of the Ophthalmic Vein for Exophthalmos, with Report of a Case.
 Brown: The Prognosis and Course of Lenticular Opacities.
 Brown: Ultimate Result of the Removal of a Foreign Body from the Vitreous.
 Brown: Mirror Writing; Clinical Report of a Case Illustrating the Ultimate Result.

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Goldberg: Implantation Cyst of the Anterior Chamber of the Eye.
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 Boyer: The Refraction of the Eye; a Statistical Report of 100 Cases Selected in Numerical Order.
 Chandlee: Rupture of the Choroid.
 Knox: Herpes Zoster Cornealis.

FROM THE AURAL AND LARYNGEAL DEPARTMENT OF THE HOSPITAL.

From Dr. Eves's Service.

Eves: Removal of Foreign Bodies by Direct Bronchoscopy and Esophagoscopy.

FROM THE ORTHOPEDIC DEPARTMENT OF THE HOSPITAL.

Ashhurst: A Case of Flat-headed Femur (Perthes's Disease).
 Gill: The Treatment of Infantile Paralysis During the Period of Recovery.
 John: The Treatment of Caries of the Spine by Bone-Transplants; a Report of 23 Cases.

FROM THE DEPARTMENT OF DENTAL SURGERY.

Cameron and Faggart: Report of the Department for 1916.

FROM THE REPORTS OF THE SUPERINTENDENT FOR 1915 AND 1916

	1915	1916
Patients admitted	4,534	5,159
Patients remaining from previous year	283	320
Total number treated during year	4,817	5,479
Patients discharged	4,089	4,655
Patients died	408	481
Patients remaining December 31, 1916	320	343
Total	4,817	5,479
Average daily number of patients in hospital	309½	333
Capacity of hospital (beds)	500	500
Ambulance calls	1306	1379
Ambulance accident calls	422	434
Total	1,728	1,813
Average daily number of ambulance calls.	4.75	4.95
Average duration of treatment of in-patients, excluding those in Harrison Memorial House for Incurables (days)	19	20
Cost of patient per day ¹	\$1.67	\$1.75
Gross cost of patient per day (calculated on total expenditures of all kinds)	1.94	2.02
New Patients treated in the Dispensary:		
Medical	4,310	3,485
Surgical	6,641	7,559
Eye	2,769	2,931
Ear, Nose and Throat	2,344	2,021
Skin	758	587
Orthopedic	469	517
Genito-urinary	255	264
Dental	1,067	1,091
Receiving Ward	7,219	7,794
Pediatric		218
Special Clinic for Syphilitics		78
	25,832	26,545
Average daily number of Dispensary patients	260	273
Average daily number of Emergency cases treated in Receiving Ward	19.80	25.47

¹ Cost of patient per day, as distinguished from gross cost, means the deduction of \$12,000 for the Dispensaries and the deduction also of the Improvement and Repair Account. These figures include all patients admitted to the wards.

REPORT OF THE CHIEF RESIDENT PHYSICIAN

THERE are on the Resident Staff sixteen physicians and a dentist. Eight men are appointed yearly by the Board of Managers, two coming on at a time every three months. Two parallel services ("A" and "B") run throughout the period of two years. The schedule is so arranged that the service is divided into eight periods of three months each; in the second, third, fourth, and fifth periods the residents exchange their services at the end of six weeks.

SCHEDULE			
Station No.	Service.	Duties.	
1 . . .	A	Laboratory.	
	B		
2 . . .	A	Eye service	Alternate six weeks.
		Medical Dispensary	
		Eye Dispensary	
		Ether	
	B	Nose and Throat Service	
		Medical Dispensary	
		Nose and Throat Dispensary	
		Ether	
3 . . .	A	Aspinwall Ward (Convalescent Girls)	Alternate six weeks.
		Surgical Dispensary	
		Ambulance No. 2	
		Ether	
	B	Orthopedic Service	
		Surgical Dispensary	
		Ether	
4 . . .	A	Ambulance	Alternate six weeks.
		Ether	
	B	Maternity	
5 . . .	A	Men's Medical Ward	Alternate six weeks.
		Harrison Memorial House (Incurables)	
		Women's Medical Ward	
		Children's Medical Ward	
	B	Pediatric Service	
6 . . .	A	Women's Surgical Ward	
		Children's Surgical Ward	
	B	Women's Surgical Ward	
		Children's Surgical Ward	
7 . . .	A	Men's Surgical Ward	
	B	Men's Surgical Ward	
8 . . .	A	Receiving Ward	
	B	Receiving Ward	

This schedule is new, having been put into use in November, 1916. Owing to changes about the institution and additional requirements of the Pennsylvania State Board for Medical Licensure it was found necessary to make this change. It is much more satisfactory than the schedule used formerly, in that it is so arranged that it begins with a period which requires the least experience of any, and ends with the one which requires the most, namely, the Receiving Ward. This facilitates matters for everyone concerned and also enables the resident to get much more benefit from his service than he would otherwise.

The Workmen's Compensation Act, in its short existence, has brought up several questions which concern the professional and financial work of the hospital. The latter I will not bring up here as it will be discussed elsewhere. One question was, who was to decide whether or not the case should be admitted to the hospital wards. Oftentimes employees with trivial injuries which could easily be treated in the dispensary are requested to be admitted by their employer.

Another question is whether or not "compensation cases" should wait their turn for treatment or everything be dropped and they attended to at once. A firm stand has been taken and the "compensation cases" are treated just as any other patient, apparently to the satisfaction of all concerned.

The Isolation Wards have been opened at various times for cases of tetanus, erysipelas and specific vaginitis in children. There has been no outbreak of any of the exanthemata. Many cases of diphtheria and poliomyelitis in its acute stages have applied for admission but were recognized and turned over to the Bureau of Health.

During the recent epidemic of poliomyelitis the Aspinwall Wards, which formerly were used for convalescent female children and orthopedic cases, were opened exclusively to cases convalescing from poliomyelitis. There are accommodations for forty, but the highest number under treatment

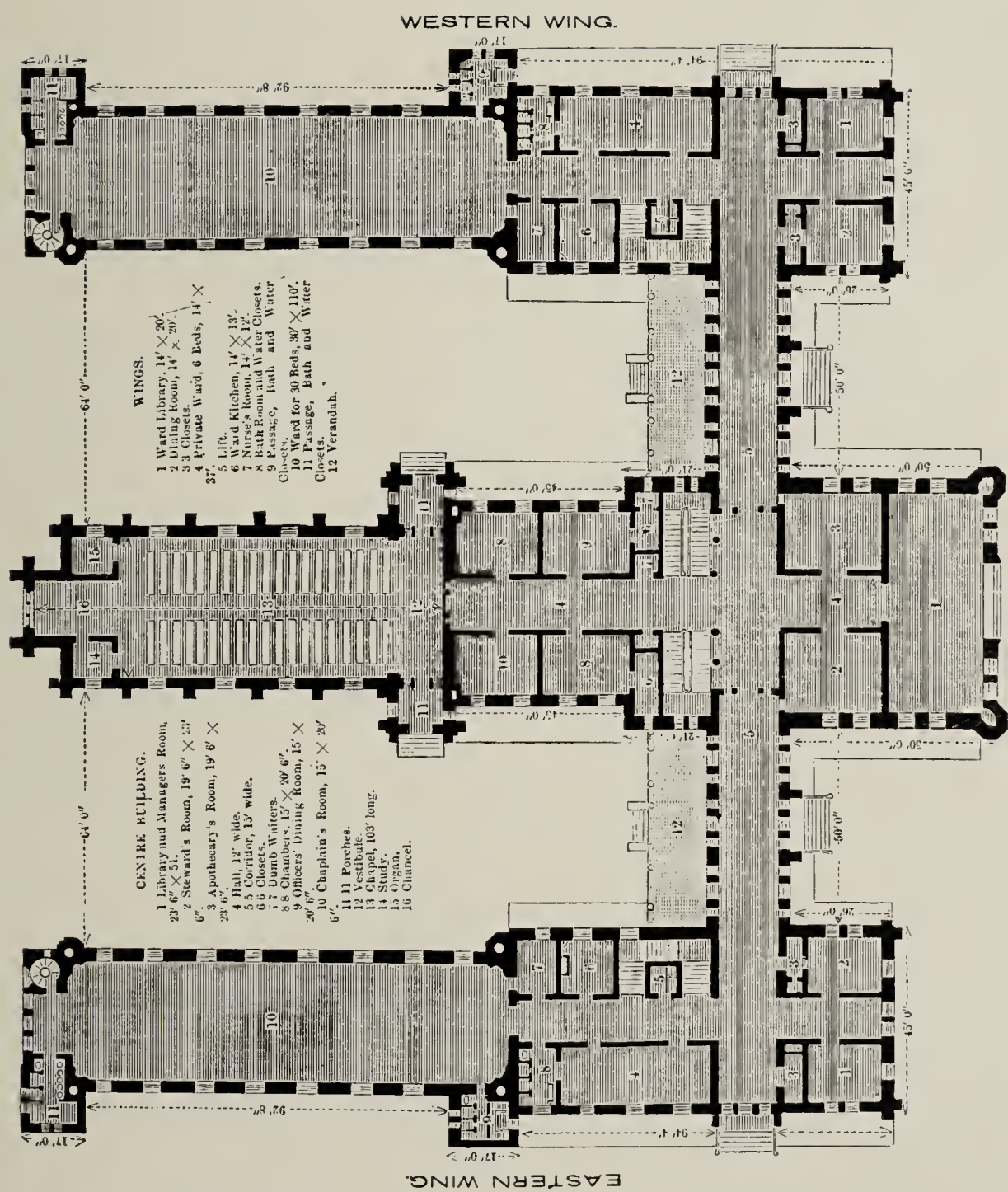


FIG. 2.—Hospital of the Protestant Episcopal Church in Philadelphia, ground plan

at any one time was thirty. These children have been provided with special medical and nursing attention in order to safeguard against its spreading; a desirable precaution in the present state of knowledge.

Three of the pupil nurses have been advised to give up training on account of ill health; one case of chronic endocarditis with decompensation, one case of neurasthenia, and one case of pulmonary tuberculosis. Seven have been operated on for diseased tonsils, one for ischio-rectal abscesses, one for severed tendons of the hand. Infected hands have been prevalent but the number decreased with the freer use of disinfectants.

There has been recently added to the hospital a Dental Surgical Department, to which are referred all cases coming under that head.

The Resident Staff has formed a well-organized clinical Society which meets once a week. At each meeting papers are read and cases demonstrated. Members of the Visiting Staff are asked at different times to give the society lectures on subjects in their line. The object of the society is not only to broaden the knowledge of its members but to work for the uplift of the institution.

IRVINE M. BOYKIN, M.D.,
Chief Resident Physician.

SKETCH OF THE HISTORY OF THE EPISCOPAL HOSPITAL¹

By ELLISTON J. MORRIS, M.D.
PHYSICIAN TO THE HOSPITAL

IN the time allotted to me I can no more than give a brief outline of this institution—one of the most important of the many charities of the city, caring for 4817 patients within its wards and 25,832 (paying 79,412 visits) in its Out-patient Department during the year 1915, the latest available statistics.

It is a curious coincidence that I should talk to you just at this time in regard to the hospital, since we will find that at least twice the Christmas Season with its message of good-will enters into its history.

Mr. Deitrick Knickerbocker, when he wrote his *History of New York* thought best to preface his work by a history of the world. Almost as far afield as this, I would ask you to go to Boston as one of the sources of the Episcopal Hospital.

One Christmas time a Boston lad was led to enter St. Paul's Episcopal Church in order to see the decorations which were not common in the church to which he belonged. He was not an Episcopalian nor had he any intention of becoming a member of that church, but from this visit and other subsequent ones he was led some years later to connect himself with that form of worship. The Rector of St. Paul's Church, Boston, at that time was Alonzo Potter, afterward Episcopal Bishop of Pennsylvania, and the Boston lad was William

¹ Read before the City History Society, December 13, 1916.

Bacon Stevens, afterward rector of St. Andrew's Church, Philadelphia, and still later Bishop Potter's successor as Bishop of Pennsylvania.

One spring morning a young medical student rode from his father's farm at Overbrook, then well outside the city, to the house of the professor of surgery for his final examination. He fastened his horse in front of the house, determined that if he failed in his examination he would ride out into the world and would not be heard of until he should have made a name for himself and overcome the disgrace of failure. Fortunately he did not fail and no one who knew the young man would have had any idea that he would fail. He became a resident physician at the Pennsylvania Hospital, and later the beloved physician and councillor of many in Philadelphia. To these three men, Alonzo Potter, William Bacon Stevens and Caspar Morris we owe the beginning of our hospital.

Dr. Potter was consecrated Bishop of Pennsylvania at Christ Church, Philadelphia, on September 23, 1845; and he at once determined that the Episcopal Church should make itself felt as a power for good in the community, and with that end in view he invited the coöperation of a number of influential laymen. There is no exact record of those whom he so invited, but we do know that among them were the Hon. Joseph R. Ingersoll (late Minister to the Court of St. James), George M. Wharton, Benjamin W. Frazier, Henry Ingersoll, Samuel Welsh, John Welsh (afterward also the representative of the United States at the Court of St. James), Benjamin G. Godfrey, William Welsh and Dr. Caspar Morris. The meetings were generally held at the house of Mr. John Welsh, which stood when I knew it at the southeast corner of Eleventh and Spruce Streets. At these meetings various projects were discussed, among them being a savings fund, a dispensary for the care of the sick at their homes and a hospital for the care of sick and wounded. The imperative need for a general hospital was urged by Dr. Morris, who showed how lacking Philadelphia was in hospital accommodations as

compared with European cities. The Bishop and his advisers debated earnestly in regard to the various projects and it was finally determined that the hospital was the greatest need. Even then the question arose as to whether it should be attempted by the Episcopal Church alone or other religious bodies invited to join in a movement. After long discussion of the subject, but without coming to any definite conclusion, Dr. Morris was asked to prepare an appeal to the public and this he did in his *Appeal on Behalf of the Sick* which was issued in 1851. At that date the only hospitals in Philadelphia were the Pennsylvania, founded about a century before, the Philadelphia Hospital at Blockley, the Wills Eye Hospital, and St. Joseph's Hospital, but lately begun at Green Hill, now Sixteenth Street and Girard Avenue.

The first general preliminary meeting of clergy and laymen was held on March 14, 1851, at which meeting resolutions were passed expressing the need for more hospital accommodations for the destitute sick and stating that this work should be undertaken by the Episcopal Church. A committee of nine was appointed to "consider and report to a future meeting the most eligible plan for the attainment of the object proposed." The resolutions were offered by the Hon. Joseph R. Ingersoll seconded by G. M. Wharton, Esq., and the following were appointed on the committee: Rev. Dr. M. A. DeWolfe Howe, Rev. Mr. William H. Odenheimer, Hon. J. R. Ingersoll, Dr. Caspar Morris, Mr. Peter McCall, Dr. William Keith, Mr. I. Fisher Leaming, Mr. G. M. Wharton, Mr. William Welsh. Later Bishop Potter and John Welsh, Jr., were added to the committee.

Further meetings were held at which it was decided that the corporate name should be "Hospital of the Protestant Episcopal Church in Philadelphia." The Episcopal clergy throughout the city were requested to preach sermons on the subject and among those who responded to the request was Dr. William Bacon Stevens, at that time rector of St. Andrew's



FIG. 3.—Leamy Mansion, occupied as the first home of the Episcopal Hospital from 1852 to 1863



FIG. 4.—General view of the Hospital Buildings as proposed in 1861



FIG. 5.—Front view of building erected in 1863



FIG. 6.—View from south (1863)

Church, Eighth Street above Spruce. This sermon was preached on May 11, 1851, the text being from the Fourth Chapter of the Gospel of St. Matthew, twenty-fourth verse: "And his fame went throughout all Syria, and they brought unto him all sick people that were taken with divers diseases and torments, and those which were possessed with devils, and those which were lunatic, and those that had palsy; and he healed them."

Unfortunately the sermon has been lost and no record remains of what Dr. Stevens said, but he was fully able to present the needs of the sick for whom the plea was made. He had practised medicine for some years before entering the Episcopal ministry and his knowledge of sickness combined with his polished eloquence must have made his utterance forceful and convincing. In the congregation were two ladies, Miss Ann Leamy and her sister, Mrs. Elizabeth H. L. Stout and, moved by Dr. Stevens's sermon, they shortly afterward proposed to give to the hospital a part of the estate which they had inherited from their father and which was called Tusculum and lay at the corner of Front Street and Lehigh Avenue.

This site for the hospital was not selected without many misgivings on the part of the committee as to its suitability. It seemed so remote from the populous part of the city that the wisdom of accepting the proposed gift of land appeared to some to be dubious. I have a letter from Mr. J. R. Ingersoll to Dr. Caspar Morris urging him to see Miss Leamy and secure the donation. In this letter Mr. Ingersoll says: "The moment has been critical, ever since a doubt was expressed as to the appropriation of the house and the particular lot on which it stands. The prosperity of the whole plan may depend upon the turn of mind, at this time, of the donor—and there is certainly a material difference among the localities." Finally the committee did accept the gift of the Leamy property; and a plot of ground extending four

hundred and ninety-one feet along Lehigh Avenue and Huntingdon Street, and containing the Leamy mansion, was deeded to the hospital by Miss Leamy and Mrs. Stout. Shortly afterward an additional plot of ground was purchased from the Leamy family, giving the hospital a frontage on Lehigh Avenue of about one thousand feet, so that the hospital now occupies a lot bounded by Front Street, Lehigh Avenue, B Street, and Huntingdon Street, with the exception of a small tract of about one hundred and fifty feet square at the corner of B and Huntingdon Streets which has lately been deeded to St. Luke's Church, the outgrowth of the Mission so long conducted by friends of the Hospital.

The alterations to the Leamy Mansion, to fit it for the purposes of a hospital were completed in the early part of December, 1852, and it was opened on December 11, but it was not until Christmas Eve that the first patients were received. (A curious coincidence that it should have been the Christmas decorations which led William Bacon Stevens first to enter an Episcopal Church; that his sermon led to the gift of the ground for the hospital; and that its first patients should have been admitted on Christmas Eve.)

On December 24, 1852, came the first patients, a family of four suffering from typhus fever, a disease happily now practically extinct and only appearing in time of war and neglect of sanitation. These four patients recovered, but some of the hospital staff contracted the disease and tradition says that one of the nurses died, and if this be so it was then that the hospital received its baptism of blood and a life was required for a life saved. Another account says that "a visitor introduced fever into the house in which the family resided. The mother sickened and died, leaving the husband and three children ill with the same disorder, without any caretaker, or means of providing one. When taken to the hospital, the father and oldest son were both trembling on the very verge of life. The two younger children were less seri-

ously ill, though both required much attendance and nursing. They were suffering extremely from want and lack of the commonest attentions, and would doubtless all have perished but for the timely aid of the Institution." This well illustrates the crying need there was for the hospital.

The report of the hospital for the year 1852 shows that in the few weeks in which it was open eleven cases were treated, but the work grew and it was shortly found that the Leamy Mansion was entirely too small. Subscriptions were therefore asked for and the ground for the larger buildings was broken in the spring of 1860. I am unable to discover the exact day of the month. Dr. J. Cheston Morris tells me that one day, while he was making his rounds as visiting physician he was sent for to turn the first sod, as the representative of his father, Dr. Caspar Morris. He gives the name of Mr. John Welsh as being present, but does not give the names of any others, so that apparently there was little ceremony at the turning of the first sod. As Dr. Cheston Morris took the spade from Mr. Welsh's hands Mr. Welsh said to him "You must make a speech." Dr. Morris then said:

"In nomine Patris, et Filii, et Spiritus Sancti, hospitium instituo: ad majoram Dei gloriam salutemque generis humani."

(In the name of the Father, and of the Son and of the Holy Ghost I begin this hospital, to the greater glory of God and the salvation of humanity.)

Mr. Welsh responded "Amen."

Dr. Morris then turned to Mr. Welsh and said: "I have placed this spade in the earth as the representative of my father; you by your genius and labors have succeeded in raising the money to build this institution. I therefore think it devolves on you to take out this first spadeful of earth." So the present hospital buildings were begun.

The cornerstone was laid with appropriate ceremony, on May 24, 1860. Mr. Charles D. Clark, of Philadelphia, who

was present as a boy and who was later a member of the Board of Managers of the hospital, writes me in regard to the laying of the cornerstone:

March 21, 1914.
2215 Spruce Street.

“DEAR MORRIS:

“All that I can remember of the laying of the cornerstone of the Episcopal Hospital is that it took place on a very hot afternoon.

“There was a low platform of rough boards. Your grandfather, Dr. Caspar Morris, made the first address. He was followed by Bishop Potter. There was a large assembly of both clergy and laymen. I think your uncle, Dr. J. Cheston Morris, dug the first sod when the ground was broken.

“The year before this, 1860, the Fifth and Sixth Streets horse-car line came fairly near the hospital; prior to that there was an omnibus line that ran out Sixth Street. It stopped at a drover's tavern and then went back. After that it was shanks mare and mud. Lehigh Avenue was opened but not paved for some time after this.”

The original plan of the hospital called for a central administration building and chapel, flanked on either side by the wards, which were connected with the central building by covered corridors on each floor. Only sufficient money was raised in 1860 to build the central building and chapel and the western wing. In 1861 came the Civil War and the work on the hospital went slowly because of the difficulty in obtaining labor and materials. Then in 1862 came the appeal of the Government for hospital accommodations for sick and wounded soldiers, and the buildings under construction were rushed to completion and offered to the Government. The Government took possession at the close of July, at which time forty sick and wounded soldiers were received by Dr. Richard A. Cleemann, United States contract surgeon in charge. An extract from the report of the chaplain of the Hospital will give some idea of the scene:

“Our first patients were received in July. Never shall we forget that scene. It was eleven o’clock of a gloomy night. To cheer the spirits of the sufferers the whole west wing was lit up, and it could be seen by them a mile away. The wards and corridors of the immense pile up to the fourth story, along with the massive towers, were light as day. The effect of the view within was equally great. Completely bewildered, one said, ‘Is it one of the palaces we read about!’ and another replied to the doctor, who said, ‘Lie down, my poor fellow, you are exhausted,’ ‘Oh, doctor, let me look; it seems as though we had got to Paradise.’ These soldiers were dangerously wounded before Richmond; were in the hands of the rebels a month; their wounds dressed but once; their food, flour and water. Of forty-six, all but one were brought in on stretchers. Their constitutions were so broken as to ‘have little to build upon.’ The mortality during the hot weather, in consequence, was great. Though ‘used,’ as they said, ‘to hard scenes in the field,’ yet the frequent deaths of companions here, ‘where they expected and had ever attention,’ seemed to discourage the survivors. The majority of the funerals were therefore in private.”

In all, seven hundred and five soldiers were received into the hospital during the nine months in which it was used by the Government, before it provided hospitals of its own, elsewhere. The doctors connected with the hospital, as well as the other administrative officers, were sworn into the service of the United States and Dr. Samuel R. Knight, superintendent at that time and during my days as resident physician, was wont to boast jokingly of his war service and how he had “fit and bled” for his country, though he had to confess that his campaigning did not extend beyond the Episcopal Hospital.

In March, 1863, the soldiers were removed to other Government hospitals and the Episcopal Hospital took possession of these new buildings for its own patients, who had meanwhile been accommodated in the Leamy Mansion. As the popu-

lation in this section of the city increased, the need for hospital accommodation increased also, and in 1875 the east wing was completed and opened for patients, the west wing being used for men patients and the east wing for women and children, and thus completing the hospital as it appears in the architect's sketch made when the institution was first planned. But as time went on, the appeal of those patients who were incurably ill became more and more imperative. It would not do to overcrowd the wards with these, to the detriment of others equally deserving and whose stay in the hospital would be shorter because the acute disease could be cured. Therefore some accommodation for the incurable must be found outside the wards and the family of Mr. George Leib Harrison were led to build and endow the building which stands to the eastward, on the site of the Leamy Mansion. This, the Harrison Memorial House for Incurable Patients, was opened and dedicated on Thursday, October 29, 1891.

The advances in surgery had rendered the old operating rooms not desirable, in the light of modern knowledge, and efforts were made to better the conditions. These efforts resulted in the erecting of the Ingersoll Building from a legacy received from Sarah Emlen Ingersoll. This building with its modern operating rooms and modern apparatus for the preparing of surgical dressings, as well as etherizing and recovery rooms and wards for patients, was opened on Monday, November 26, 1894, and lies to the westward of the original group of buildings.

In 1898 came the Spanish-American War. It is fresh in our memories and the less said about the medical care of our soldiers during the war, the better; but the Episcopal Hospital again opened its doors and furnished the services of its superintendent, nurses and hospital orderlies for at least one and possibly more of the hospital trains which bore the sick from the fever-stricken camps. One hundred and fifty-one sick soldiers were admitted during the summer and fall of this year.



FIG. 7.—View from southwest (1863)



FIG. 8.—Men's surgical ward, 1872

The original charter states that one of the objects of the hospital is the instruction of others in the care of the sick. Dr. Caspar Morris, in his "Appeal for the Sick Poor" had dwelt on the necessity of instructing suitable persons in the care of the sick of the community, and other physicians, while the project was under discussion, had pointed out the advantages of a hospital for such teaching. Nevertheless, although the training of nurses for the sick was undoubtedly one of the primary objects of the institution, trained nurses, such as we have today, were unknown and there was no definite curriculum until January, 1888, when the present Training School for Nurses was opened. Up until this time the nursing had been done by men nurses on the men's wards of the hospital and by women on the women's wards (except during the time when the soldiers occupied the hospital, during the Civil War, when volunteer women nurses most generously came to the aid of the regular hospital nursing staff). These men and women nurses stayed in the hospital year in and year out and many had grown gray in the service. There was no attempt at any sort of a graded course, or indeed any instruction beyond what they themselves could gain by observation and experience. There were no diplomas or certificates granted and, while some undoubtedly did leave the service of the hospital and engage in private nursing, they carried with them no official endorsement from the hospital. These nurses of the former régime were quartered in rooms off the wards on which they were employed and the room of the head nurse on each ward had a window opening into the ward so that the head nurse could observe the state of the ward at all times, day or night. The increase in the number of nurses, by reason of the opening of the Training School, made necessary other accommodations than could be provided within the hospital buildings; furthermore it was desirable that they should have a place for recreation during their hours off duty. To the generosity of the Misses Anna, Harriet and Maria Blanchard we owe the Nurses' Home which was occupied in

April, 1900, and has since been enlarged by the same generous donors.

In 1896, Mrs. Anna B. Aspinwal left by will a large portion of her estate to the hospital to provide a building for "Poor White Female Orphan Children who have been ill and are convalescent." After some years of litigation, because the will was contested by a relative of Mrs. Aspinwall, a compromise was effected and the present Aspinwall Building was erected. This building lies to the south and east of the original group of buildings. Owing to the difficulty of finding a sufficient number of white female orphan convalescents, the courts have allowed the hospital considerable latitude in the interpretation of the trust and the building has been occupied by girl cripples and lately by children convalescing from acute anterior poliomyelitis (infantile paralysis).

The quarters of the Out-patient Department had for years been in the basement of the hospital, but they were fast becoming totally inadequate to the needs of the hospital community and therefore in 1906 the building on Huntingdon Street below Front Street, which had been used as a Mission Church and Sunday-school founded by friends and supporters of the hospital, but in no sense part of the hospital organization, was taken over by the hospital and converted into quarters for the various departments of the Out-patient Service. For the uses of the Mission and in exchange for their building a plot of ground was given at the southeastern part of the hospital plot and on this stands today the Church of St. Luke, as I have said in an earlier part of this sketch.

With the advent of the modern practice of isolation of contagious diseases and the prevention of the spread of these diseases thereby, the hospital found itself deficient in proper accommodation for such cases, for cases of contagious diseases will arise in every hospital despite the greatest care. In 1907 the generosity of Mr. James Logan Fisher provided a model building for such purposes, as a memorial to his wife. The building was opened in December, 1907, I think about Christ-

mas Eve and I would like to think it was on Christmas Eve because then once more would come the echo of the first Christmas message; but the records at my disposal only say that it was opened "late in December." When it was built it was understood that we would be allowed to admit a few cases of the minor contagious diseases, such as measles; there is need for a hospital for contagious diseases, other than the City Hospital, in this city, which is fast becoming filled with apartment houses. No one who has not encountered it knows the consternation which a case of contagious disease brings in such a place. The apartment house cannot allow the case to remain; the other inmates rise in arms if the management dream of doing such a thing and there only remains the City Hospital for the child. The management of the Episcopal Hospital hoped to be allowed to partly fill this need by supplying accommodations for a few such cases who could afford to pay for their care and treatment, but the Board of Health ruled that the hospital could not do so and the hospital found that its isolation building was too large for the use only of its own population and it was therefore converted into a ward for children in 1911, and the children removed from the main building, enough isolation quarters being reserved for the necessities of the hospital service. To my mind it is not ideal as a children's ward; it was not built for that purpose and I hope that it is only a temporary arrangement until the generosity of some one furnishes the institution with a children's ward such as should be.

The house for the superintendent (Lehigh Avenue, east of Harrison Home) was erected in 1907; and a Social Service Department was established October 1, 1913.

Such is a brief sketch of one of Philadelphia's many charities. Many things have been omitted or lightly passed over wherein an extended study would be useful and interesting; for example, no mention has been made of physicians and surgeons or of management except as it comes into the story.

JOHN ASHHURST, JR.

BY WILLIAM P. BELK, M.D.
RESIDENT PHYSICIAN IN THE HOSPITAL

It seems peculiarly appropriate to mention, at least briefly in this volume, a man who was most closely identified with the early growth and development of the hospital.

John Ashhurst, Jr., was born in Philadelphia in 1839. He was a delicate boy, given to indoor life, finding his pleasures in books and the study of music. His early training he got from his mother and private tutors. At the age of seventeen he received the A.B. degree from the University of Pennsylvania with the highest record ever made in that college up to that time.¹ While still an undergraduate he was for a time assistant in chemistry under Professor Frazer. He then entered the Medical School of the University, and after a course of three years, which was one year longer than the accustomed course of that day, he took his doctor's degree in 1860. For one year he was an interne in the Pennsylvania Hospital. Dr. Ashhurst was always careful to specify that he had served two terms as a substitute for interne in the Pennsylvania Hospital; having failed to receive a regular appointment, he did not wish to leave a false impression with the hearer.

At the outbreak of the Civil War, Dr. Ashhurst was made acting assistant surgeon of United States Volunteers, and

¹ A mark of 14.997 out of a maximum of 15. This record was once subsequently surpassed by a brilliant student who unfortunately became insane soon after graduation.

assigned to the Chester U. S. A. General Hospital, at Chester Pa.; and later served in the Cuyler U. S. A. General Hospital (in Germantown, Philadelphia), acting as its executive officer until the end of the war, in all about three years. Being more enterprising than his associates, he was accustomed to meet the boats or trains coming in with sick and wounded soldiers and select the cases he wanted for his own service. In this way he got a majority of the most interesting and instructive cases.

In 1863, when twenty-four years of age, Dr. Ashhurst succeeded Dr. R. P. Thomas as visiting surgeon to this hospital. The hospital was at that time still in the old Leamy Home, two wings of the present hospital building, now the men's pavilion and the administration building, hastily completed the previous year, being then occupied by sick and wounded soldiers, in the charge of Dr. Richard A. Cleemann, acting assistant surgeon, U. S. A. Dr. Ashhurst at once identified himself with the best interests of the institution and the most progressive methods in surgery. He was soon the leading physician on the staff. Entering the hospital as he did at an early period of its development, his untiring energy and devotion, for eighteen years as surgeon and twenty years as manager, were great factors in its subsequent growth and development. Likewise the hospital may rightly feel that it gave something in return, and entertain a just pride in having been a not unimportant stepping stone in so bright a career.

The surgery of that day consisted chiefly of the treatment of injuries, such as amputations and the ligation of arteries for hemorrhage. Dr. Ashhurst soon began to work in advance of the ideas then existing, carefully planning and putting into practice innovations of his own. He was especially interested in the surgery of bones and joints, and it was here that he had his first big opportunity to study the subject. He later became an accepted authority in this subject the world over. He was one of the first to advocate and practice

excisions of joints. He was also the first in this country to teach the true pathology of concussion of the brain. Though the principles of antisepsis were not known at that time, he practised something very similar to our own technic, having observed that wounds thoroughly cleansed healed more readily. His routine was to wash the wound with turpentine, then soap and water, a strong solution of potassium permanganate, and lastly alcohol. His results were said to have been much better than those of his associates or contemporaries.¹ He paid much personal attention to his patients, often dressing the ward cases himself. He neglected no detail of the treatment from the time the patient was admitted until he was discharged, often doing work that the interne felt should fall to him. He never gave his residents operations because he believed the patient should have the best skill available. He sometimes allowed the young doctor to do finger amputations, but it was distinctly understood that the fingers did not extend up to the wrist-joint.

Personally, Dr. Ashhurst was always dignified, and at first did not invite ready friendship. On further acquaintance, however, he proved to be a most loyal friend, unable to see any faults in those he loved. On the other hand, he could see very little good in anyone in whom he had lost faith. Probably his most salient characteristics were his thoroughness, his careful attention to details, and his untiring energy. He never sought to create a favorable impression, and never attempted brilliancy or rapidity in the operating-room. His aim was rather to perform any task with the greatest efficiency, to know the final word on any subject with which he was concerned. He never jumped at conclusions or left a decision to chance. It was his custom to plan just what he would do

¹ Thus Ollier, the great bone surgeon of France, reported with satisfaction that by the adoption of antiseptic methods he had reduced his mortality following excision of the knee from 80 to 14 per cent.; while Ashhurst, in a series of 84 excisions of the knee extending through both pre-antiseptic and antiseptic periods, recorded a mortality only of 8.3 per cent.—ED.

in each operation before the patient left the ward. He was intolerant of carelessness and was rather frank in expressing his opinion. Shortly after the appointment of a young surgeon to the staff of this hospital, Dr. Ashhurst, his former chief, was watching him do a perineal repair, his first operation after his election. After completing the operation the surgeon catheterized the patient, but on removing the catheter neglected to put his finger over the end. Two or three drops of urine fell on the line of sutures. Turning to the resident physician, assisting in the operation, Dr. Ashhurst said so that all could hear, "Doctor, when you catheterize this patient do not forget to put your finger over the end of the catheter when you withdraw it, or you will contaminate the wound as this gentleman has done."

In 1880 Dr. Ashhurst resigned his position on the Surgical Staff, and was appointed to the Board of Managers on which he served until his death. In 1877 he had been elected professor of clinical surgery in the University of Pennsylvania, which position he held until his death. He was also John Rhea Barton Professor of Surgery from 1888 to his death in 1900. He was surgeon to the Children's Hospital from 1870 until 1900, and to the Pennsylvania Hospital from 1887 to his death. He was one of the founders of the Pathological Society of Philadelphia; was vice-president of the surgical section of the International Medical Congress in 1876, and was a founder of the Philadelphia Academy of Surgery (1879), and the American Surgical Association (1880). In 1863 he was elected a Fellow of the College of Physicians of this city, and was president of that body in 1898 and 1899.

In 1869, Dr. Ashhurst published *Injuries of the Spine*, a report of about 400 cases. He edited the *International Encyclopedia of Surgery* (in six large volumes), contributing himself the articles on "Amputations," on "Excisions," and on "Intestinal Obstruction." The first edition of this work was published from 1880 to 1886; a revised edition in 1888; and a supplementary volume in 1895. A French edition also was

published, in seven volumes, 1883 to 1888. It is interesting to note that he argued against operation for intussusception on account of the poor results with the methods then in use. An early monograph by him on this subject was published also in French (Paris, 1875). His greatest work was *The Principles and Practice of Surgery*. This was written almost entirely from his experiences at this hospital. The first edition appeared in 1871, and was followed by five other editions. It was for about thirty years the standard textbook of surgery.

Dr. Ashhurst was as great a teacher as a surgeon. He took a deep interest in the young men of his profession, and drew about him a number of them, many of whom are today in the front rank of surgery. To mention only those who were for years his personal assistants is to name nearly all the surgeons in this city who for the last generation have been foremost in their profession: Dr. John B. Deaver, who was Dr. Ashhurst's house surgeon at the Children's Hospital, and has been for years chief surgeon of the German Hospital, and professor in the University of Pennsylvania; Dr. Henry R. Wharton, who was his chief of clinic at the University Hospital, and his demonstrator of surgery, for years professor of clinical surgery in the Woman's Medical College, and surgeon to the Presbyterian Hospital; Dr. Richard H. Harte, for many years Dr. Ashhurst's personal assistant at the University and at the Pennsylvania Hospitals, who was for many years surgeon to this hospital, and Dr. Ashhurst's colleague as surgeon to the Pennsylvania Hospital, later adjunct professor of surgery in the University of Pennsylvania, and now the distinguished chairman of the local organization of the American Red Cross, and, by appointment of the President, chairman of the Board on Standardization of First Aid Methods and member of the Advisory Commission of the Council on National Defence; Dr. Gwilym G. Davis, who was for so many years surgeon to this hospital, now professor of orthopedic surgery in the University of Pennsylvania, and



FIG. 9.—John Ashhurst, Jr. (1863)



FIG. 10.—John Ashhurst, Jr. (1879)

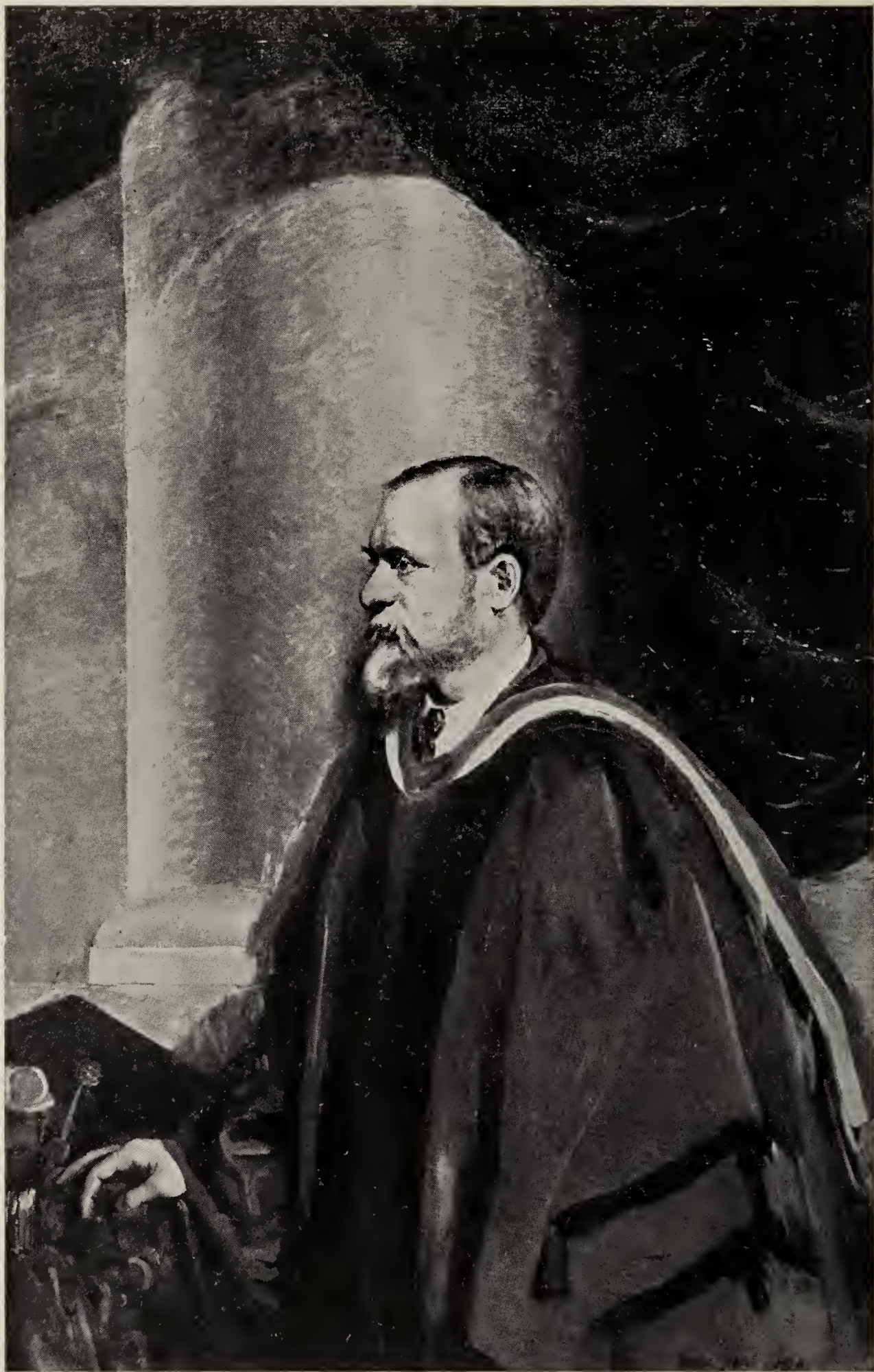


FIG. 11.—John Ashhurst, Jr. (After the portrait by Borie in the Ashhurst Room of the College of Physicians of Philadelphia.)

lately president of the American Orthopedic Association; Dr. Robert G. LeConte, who succeeded Dr. Ashhurst as surgeon to the Children's and the Pennsylvania Hospitals, and is now senior surgeon to the latter venerable institution, and has lately been president of the American Surgical Association; Dr. James P. Hutchinson, for years surgeon to the dispensary of this hospital, now one of the surgeons to the Pennsylvania Hospital, who is now doing such brilliant work in the Ambulance of the American Hospital of Paris; Dr. Thomas R. Neilson, senior surgeon of our own Staff, and professor of genito-urinary surgery in the University of Pennsylvania; Dr. John H. Jopson, for many years surgeon to the dispensary of this hospital, now Professor of Surgery in the Philadelphia Polyclinic, and surgeon to the Presbyterian Hospital—these men were, all of them, Dr. Ashhurst's chosen assistants at the University of Pennsylvania.

I quote from an article by Dr. Jopson in the *International Hospital Record* (1913), in which he pays the following tribute:

“The influences which we exert upon the minds and characters of others constitute ever-widening circles which may reach to far distant shores. In my younger days there were as now some great and influential medical men in the profession of Philadelphia. With one of these it was my privilege and pleasure to be closely associated. He was one of those who found delight in stimulating and also in affording opportunity for the outlet of the scientific energies and the professional ambitions in younger men. A man of great strength of character, of strongly marked personality, a good fighter but a firm friend, and wielding great power in the matter of hospital appointments and professional preferment he exercised the same wisely, unselfishly and justly, and now, many years after his death, no name of his generation is so well remembered, his memory is still green, and his former residents and assistants (most of them now, alas, middle aged) love to pay tribute to his great knowledge, his keen diagnosis, his unswerving friendship, and to maintain the luster of his reputation.

I refer to the late John Ashhurst, Jr. There were other great men, distinguished consultants and widely known authors, with some of whom I was professionally thrown in contact, and others whom I knew by reputation. Some of them, while also possessed of great reputations and influence, dwelt more or less in a world aloof from their inferiors, did not surround themselves with or train up men who might in time help to fill their places, who did not fight nor love, and who, while always ethical and respected, have left no lasting impression behind in the way in which I have tried to picture Ashhurst has done. Their faces too look down from the walls of our beautiful College of Physicians, but he dwells also in our hearts."

Dr. Ashhurst's latter years were devoted closely to his professional duties, his interest in his church and his home. In 1898 he suffered a stroke of apoplexy. After a lingering illness of two years, which he bore with great patience, he died in 1900, at the comparatively early age of sixty-one years.

A CHART FOR USE IN CASES OF ARTIFICIALLY
FED INFANTS

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AND

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THE Episcopal Hospital has a ward for babies, accommodat-
ing eight patients, who are, almost without exception, feeding
cases. In summer this service is considerably augmented by
cases of gastro-enteritis, and extra cribs are supplied, so that
there are often sixteen babies in the ward.

Time of Feeding								
Amount of Feeding								
Amount Taken								
Vomit? Amount								
Cry after Feeding								
Stools (when)								
Character of Stools								

Name
Date

Date of Birth

FIG. 12

During previous terms of service the greatest difficulty in
directing the complicated subject of the artificial feeding of
infants has been in getting reliable and accurate statements

each day as to the condition of each baby. The head nurse is not infrequently absent from the ward, and substitutes are often relieving the pupil nurses, who may be off duty or attending class-work at the time the attending physician makes his rounds; this being due to the irregularity in the time of the physician's visits.

As a consequence it has been impossible to know every day the condition of each baby, or to discover the effects of changes in its feeding formula. To obviate this difficulty, and to assure accurate and reliable information, the subjoined chart was prepared and has been used with the greatest satisfaction to the attending physician, resident physician and to the nurses.

We have not made inquiry to discover whether a similar chart is used at other hospitals caring for feeding cases, but we know of several in Philadelphia which have not adopted this system, and it seems desirable, therefore, to extend to other institutions the possibility of employing this innovation, which has proved of such great value to the Episcopal Hospital.

The chart measures $5\frac{1}{2}$ x 8 inches. A sheet is intended for one day's record for each baby. A margin is left at the top in order that the sheet may be inserted under the clip of the ordinary type of chart-holder, which holds the temperature chart, treatment chart and history. The fact that this chart is attached to the chart-holder, and hangs at the foot of each crib, reminds the nurse to record the facts, which were previously noted on slips of paper, kept either in the nurse's rooms or in the rooms in which the diapers and feeding bottles are washed. The proximity of the record to the patient unquestionably causes many records to be made which would otherwise be forgotten, and makes it unnecessary for the nurse to rely on her memory to supply the various facts which are to be recorded.

There are two perforations which enable the completed charts to be filed in a separate binder for each baby, in order that these records may be retained during the stay of the child

in the hospital. It is not intended that these charts should be filed with the histories, when the case is discharged, but that they should be destroyed.

We believe that our chart supplies the information usually desired in feeding cases, but it could be modified to suit the ideas of the individual physicians. The insertion of the date of birth we consider particularly useful. This obviates the necessity of referring to the history to discover the age of a baby in considering its weight, and the suitableness of the formula to its age. We recognize, of course, that the formula must be determined largely by the size and general condition of the child, but the factor of age also enters into the question of the feeding.

We find that the use of this chart adds very little to the work of the nurse. At a regular hour each day she prepares the chart for the succeeding twenty-four hours for each patient, by copying from the chart for the preceding day the hours for feeding, the amount of each feeding, the name, date, and date of birth. Of course she incorporates any changes which have been made in the interval of the feedings or the amount to be given.

The cost is not a matter of serious consideration, for it amounted to \$4.50 for 1000 charts.

INTRAVENOUS PROTEIN THERAPY

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AND

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THIS report is to be viewed rather in the light of a clinical presentation of results, than an attempt to submit a scientific contribution to the subject of colloidal dispersion. Antedating the employment of bacterins therapeutically, it had been noted by a number of observers that more or less severe, general reactions follow the use of proteins intravenously, and later other colloidal substances were found to produce similar results. When given in the course of disease processes, it was observed that these were often greatly ameliorated and sometimes promptly abated. It is with reference especially to the use of foreign proteins in the form of bacterins that we shall deal. Admittedly of some value in the chronic and more localized forms of infections, a great deal of opposition exists to their use in generalized, acute infections. Then, too, except by relatively a few, bacterins have for the most part been administered subcutaneously. Gradually, a larger group of observers is beginning to use them intravenously. Naturally, if bacterins are to be employed therapeutically in any general infection, the earlier this is done in the course of the disease, the better the result should be theoretically at least, before widespread protein cleavage and advanced secondary effects have been permitted to add to the changes taking place. As to the mode of introduction and the result

to be expected, intracutaneous injections merely cause local manifestations, subcutaneous injections give rise to more or less general reaction, usually after some hours, with or without local reaction. Intramuscular injections, if deep, rarely give rise to local changes, but the general reaction is similar to that produced by the subcutaneous route. Intravenous injections wholly lack local effects, the results being general, usually a chill with a rapid rise of temperature. Then, too, the time element and dosage must be considered. Any foreign protein exerts a more prompt effect when given intravenously than when given by any other route, and the necessary amount is much smaller. This is especially true of second injections, a fact originally noted by Theobald Smith. As to the use of stock or autogenous cultures in a strictly therapeutic sense, this seems to be of little if any importance. In fact, any foreign protein, non-bacterial as well as bacterial, and other colloidal substances will suffice, hence the reaction must be a non-specific one. If bacterins are employed, the question may arise as to whether sensitized or non-sensitized organisms give better results. We have given both many times, but have been unable to note any appreciable difference in our results. Theoretically, sensitized organisms are better. Levy and Aoki have shown that in animals immunized by sensitized bacterins, immune bodies can be shown to be present in the blood much earlier than is the case in other animals to which non-sensitized bacterins have been given. With accumulating evidence, however, we are approaching the conviction that the reaction is a non-specific one, since any colloidal substance will produce more or less reaction; hence there seems no need to consider the question of sensitized or non-sensitized bacterins, except in general sense. We find a distinct difference, however, in the degree of reaction of the patient to various types of organisms, and it is likely that other foreign proteins will be found to react with varying degrees. Jobling and Peterson state that the intravenous injection of bacterins or proteins causes a reaction in the human, but not to the same degree

nor as regularly as in animals. In animals they state that the intravenous injection of bacteria, kaolin, trypsin and split protein products, is almost always followed by a more or less marked mobilization of serum protease and lipase. Miller and Lusk, using a proteose prepared by Jobling and Petersen, obtained the same result in typhoid fever by giving it intravenously, as they did by means of typhoid bacterins given in the same manner. Their experience parallels our own in that in some instances they were able to abort an attack of typhoid fever. Especially is this true when the injection is made early in the course of the disease. When given later the severity and course of the attack are distinctly modified. Likewise, certain otherwise rebellious skin diseases may be greatly benefited by intravenous injections of a foreign protein. Of these, psoriasis and lupus erythematosus deserve special mention.

The cases submitted by us were chosen as types from among a large number of various conditions similarly treated. How the beneficent results are brought about, it is only possible at this time to speculate. Whether hyperpyrexia plays a part, as seems to be the case when erysipelas occurs as a superposed infection, and more or less modifies the primary disease, whether mobilization of ferments occurs, notably protease and lipase, or whether immunogenic properties are aroused or colloidal dispersion takes place, we can do no more than conjecture. Certain it is, that in the infections, including acute, subacute and even chronic arthritis, our experience tallies with that of Miller and Lusk.

CASE I.—A. H., male, white, aged twenty-five years. Admitted to the hospital with signs and symptoms of typhoid fever at the beginning of the third week. The patient was very delirious and markedly wasted. Widal positive in dilutions of 1 to 40 and 1 to 100. On October 16 (nineteenth day of the disease) he was given 100,000,000 sensitized specific mixed bacterin intravenously. This did not produce a chill and the temperature only rose 0.8° F. The white blood cells dropped from 5280 to 4800. Still delirious.

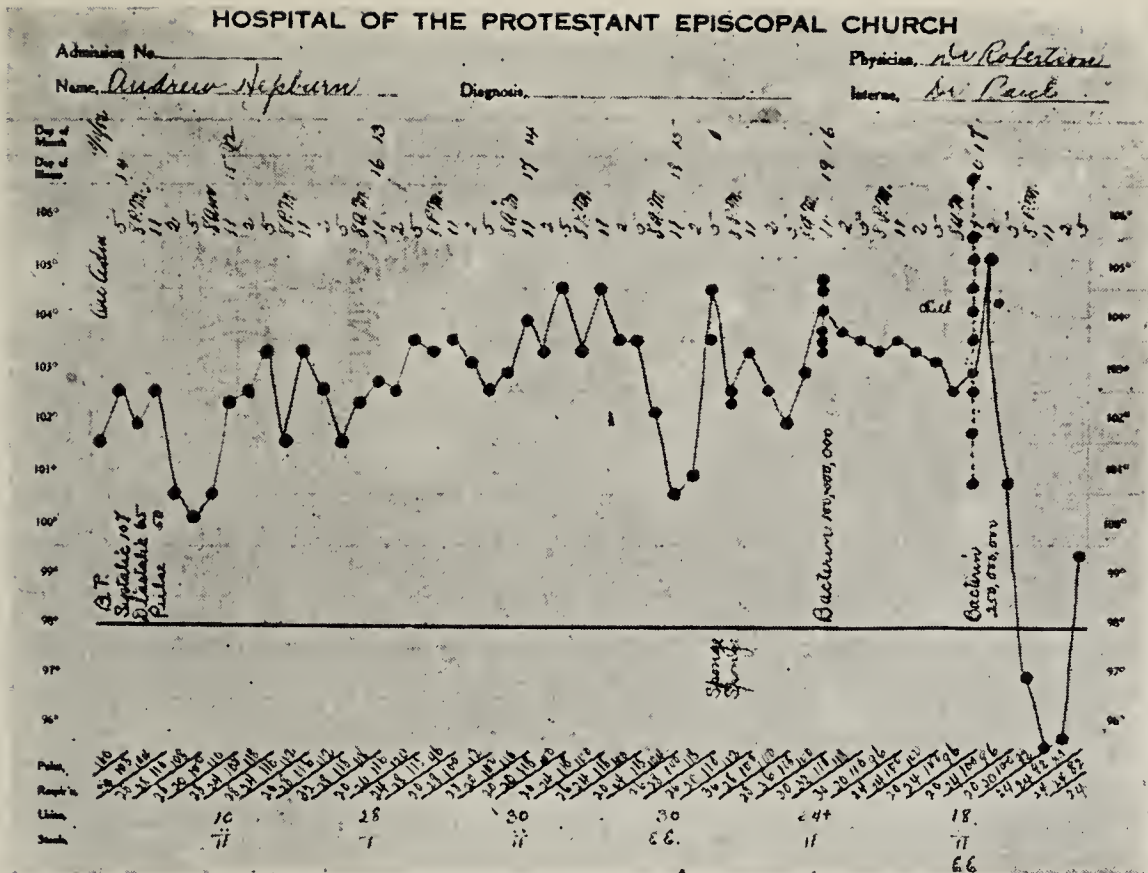


FIG. 13.—Chart of Case I

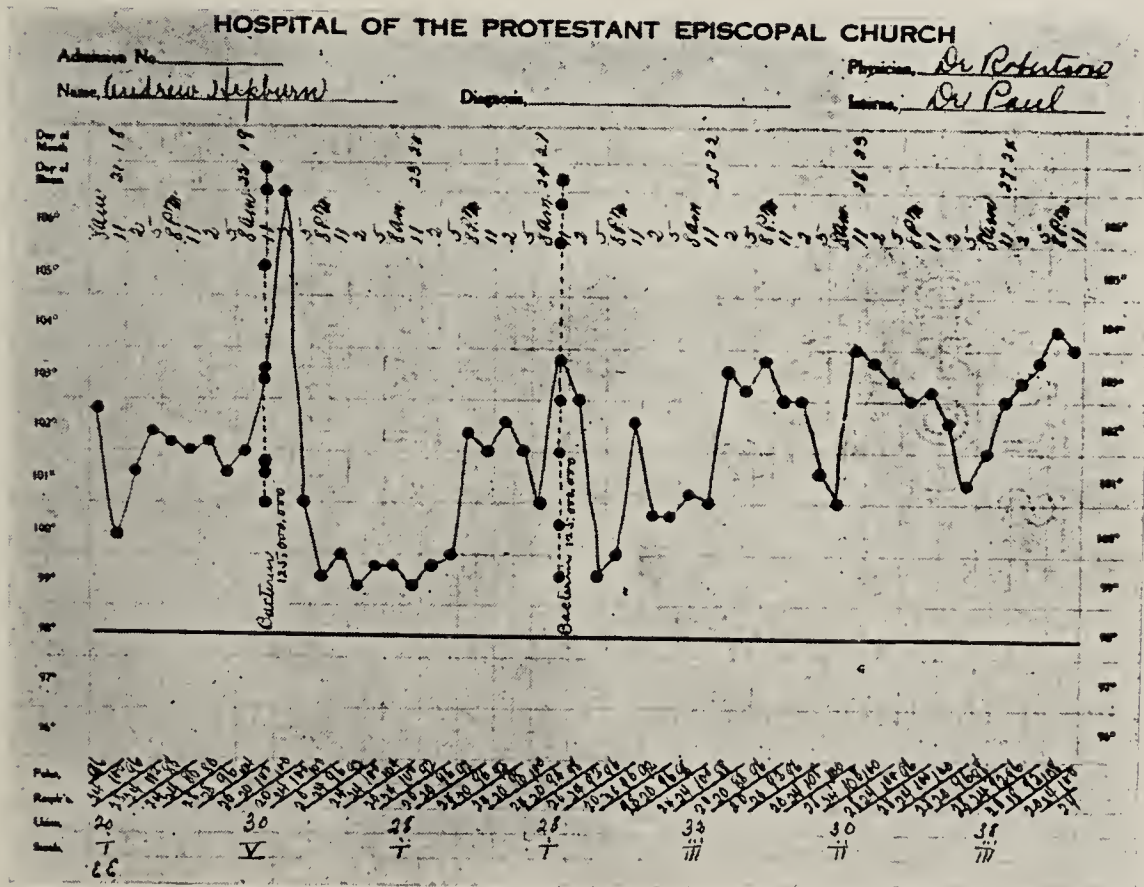
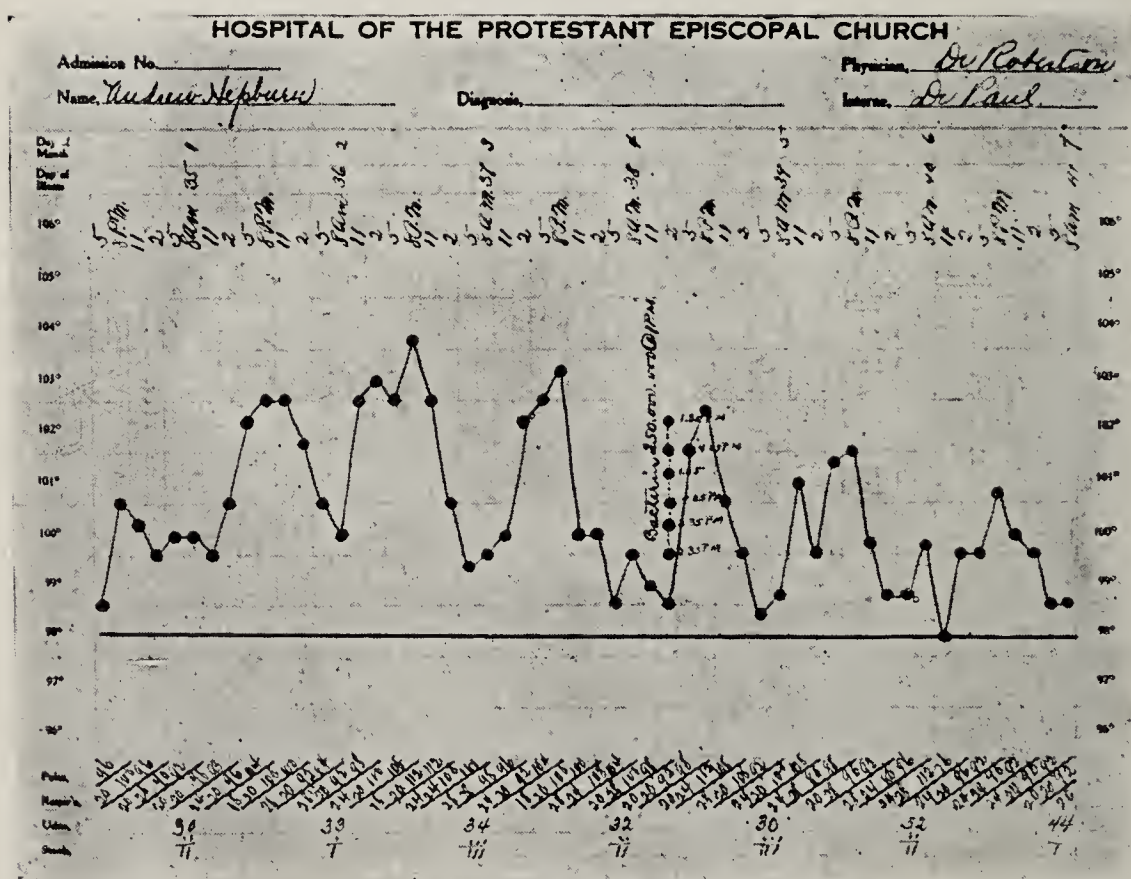
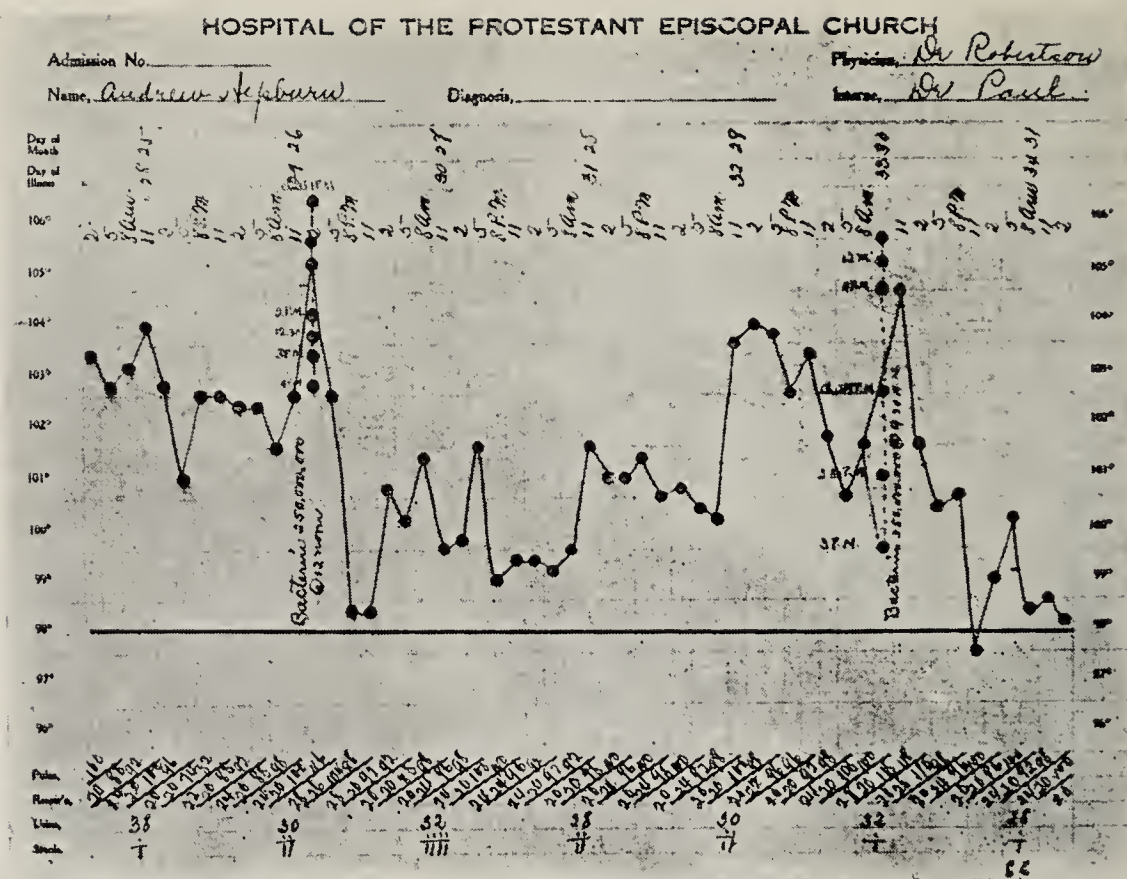
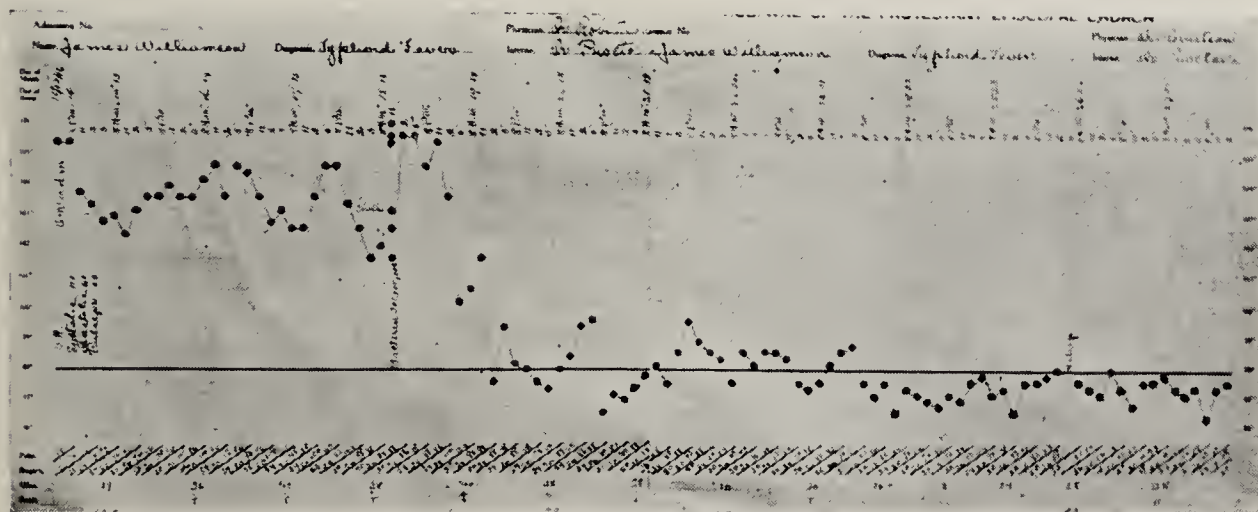
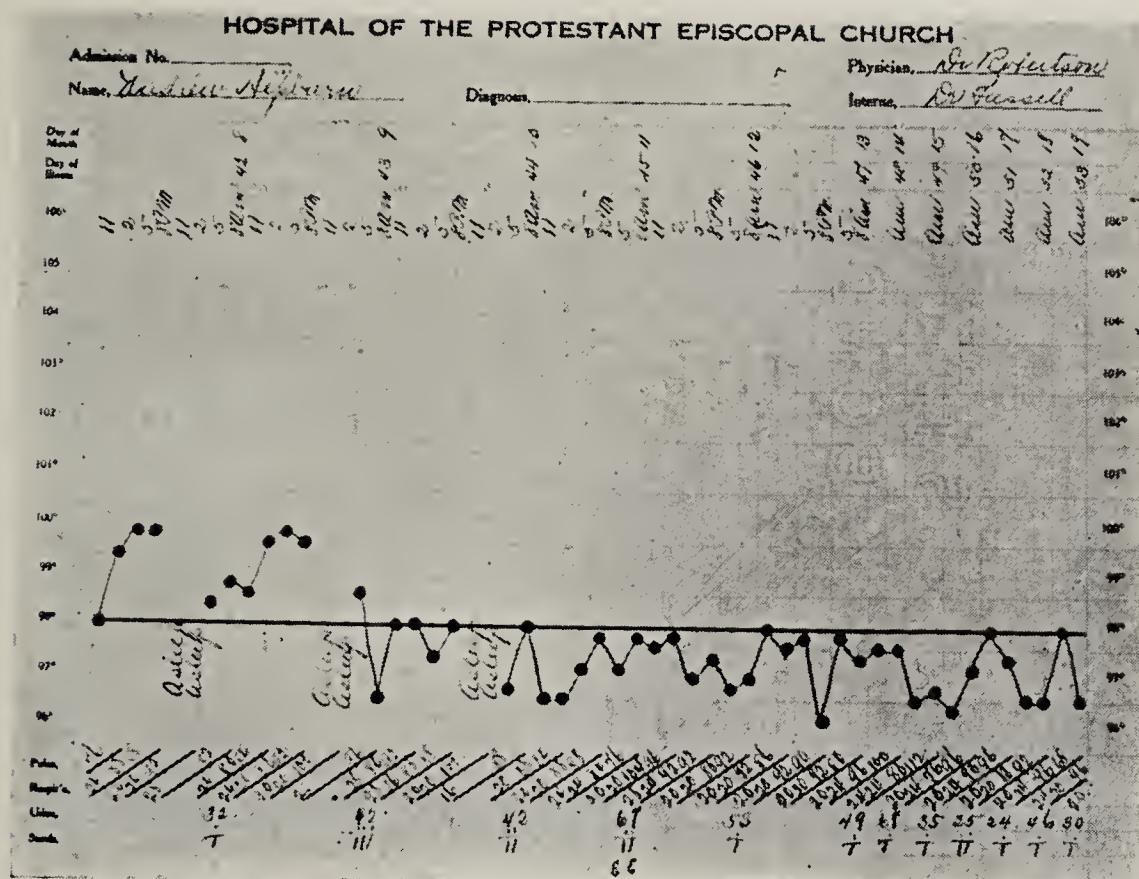


FIG. 14.—Chart of Case I, continued





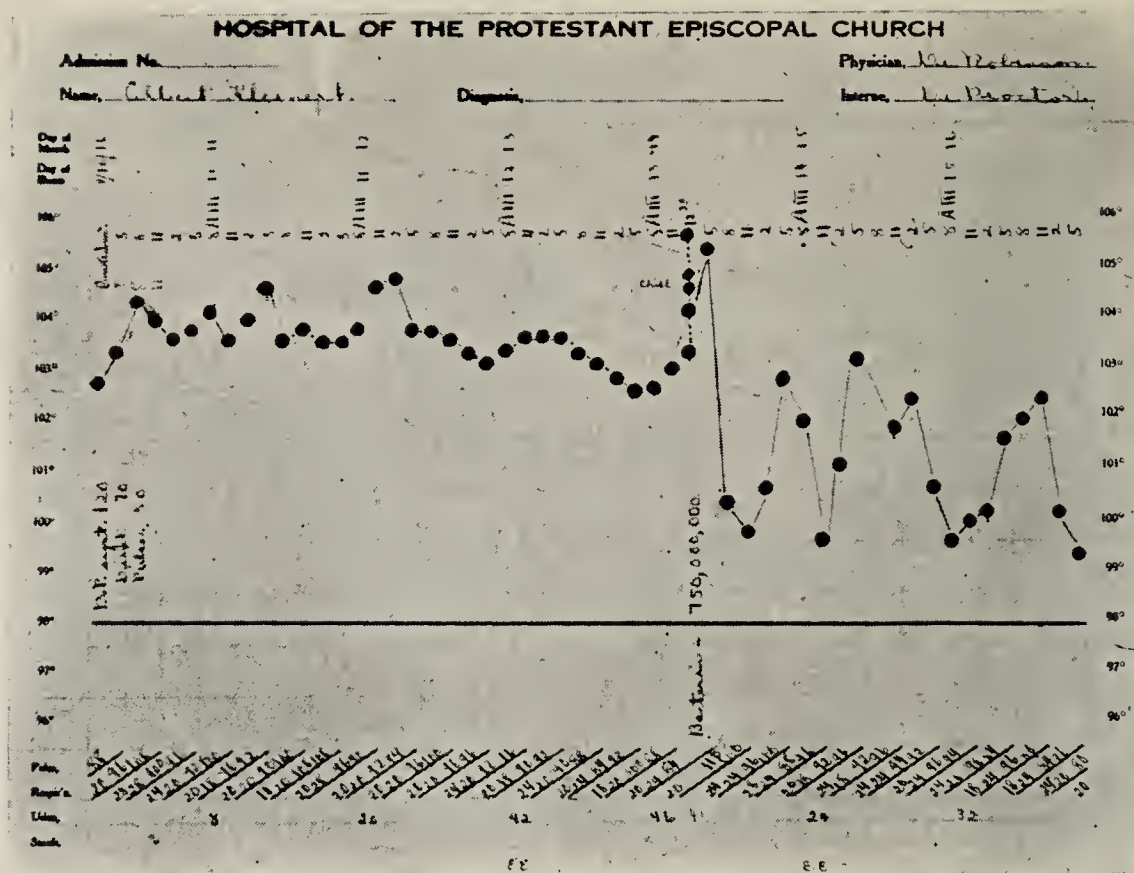


FIG. 19.—Chart of Case 3

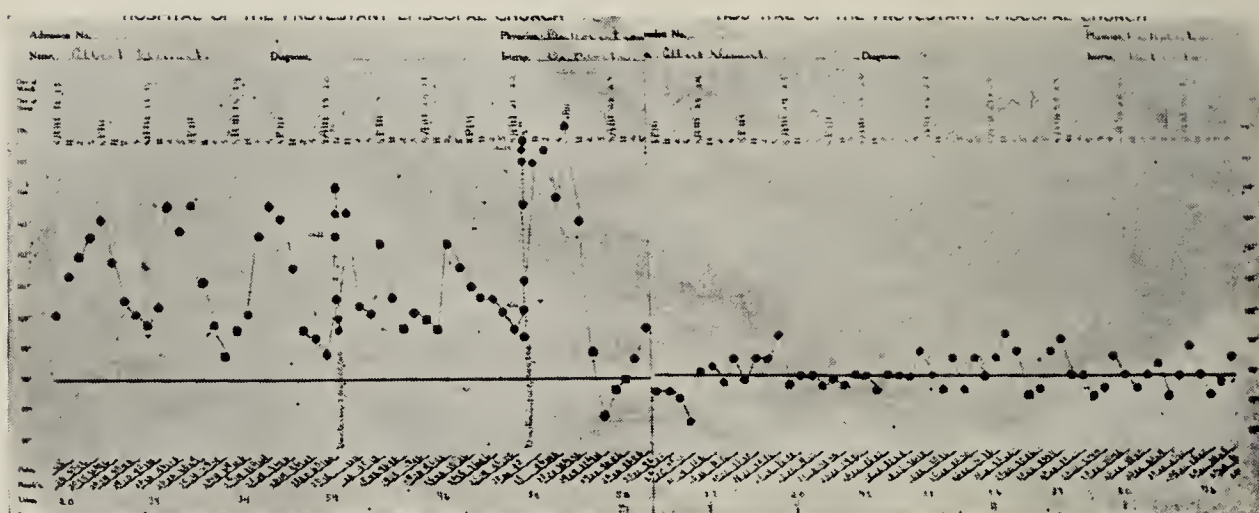


FIG. 20.—Chart of Case 3, concluded

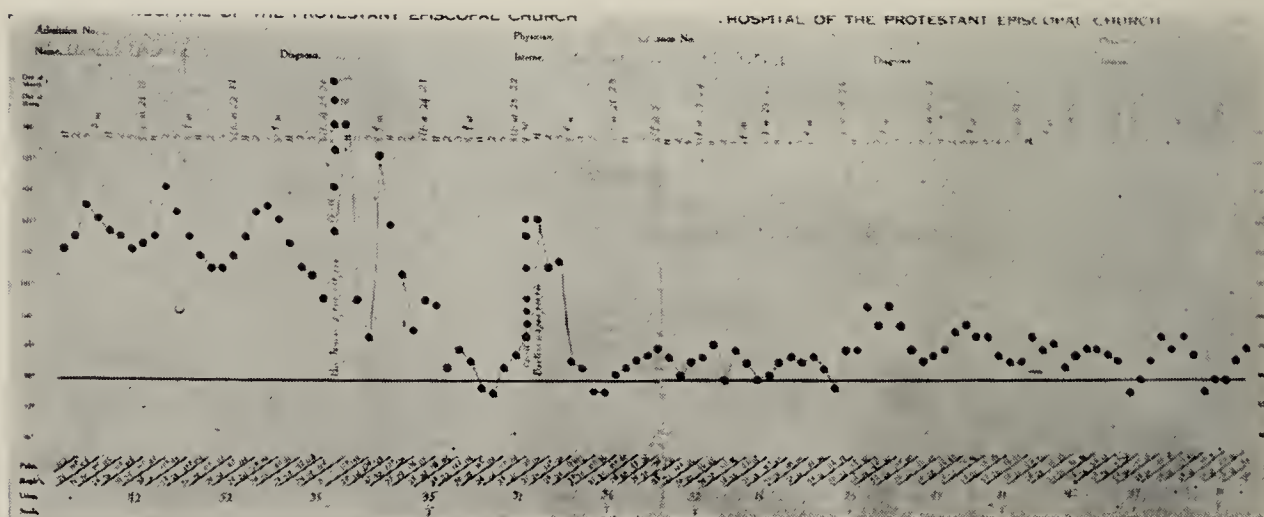


FIG. 21.—Chart of Case 4

The next day (twentieth day of the disease) 250,000,000 mixed, specific bacterin was given intravenously and was followed by a severe reaction. The temperature rose from 103° F. to 107.2° F. and dropped in twenty-four hours to 96° F. There was a severe chill. The white blood cells dropped from 5360 to 4900; the polynuclears dropped from 48 to 42 per cent. and the lymphocytes rose from 40 to 51 per cent. That night the patient was extremely violent and maniacal, slightly cyanotic and sweaty. The day following, all the delirium had disappeared and the patient was quite rational and remained so throughout the disease. Prior to this, hydrotherapy and other measures had been employed to combat the delirium, but without result. The temperature rose again, and on the twenty-second day of the disease, 125,000,000 mixed, specific serobacterin was given intravenously and was followed in thirty minutes by a chill. The temperature went up from 103.4° F. to 107.8° F., and in twenty-four hours dropped to 99.8° F. In a half hour, the white blood cells dropped from 9120 to 8400, the polynuclears fell from 46 to 41 per cent., and the lymphocytes remained the same.

On the twenty-fourth day of the disease, the temperature had again gone up to 103.8° F. The procedure of the twenty-second day was repeated. This produced a chill and rise of temperature to 107.4° F., followed in six hours by a drop to 99.6° F. Following this the white blood cells rose from 7360 to 9820 and the differential remained unchanged. Despite these marked reactions and the following rises of temperature, the delirium did not return. The temperature on the twenty-ninth day of the disease was 103° F. This time, 250,000,000 mixed, specific sensitized bacterin given intravenously caused a marked chill and a rise of temperature to 106.8° F., followed in seven hours by a drop to 98.8° F. The white blood cells fell from 6480 to 5200, the polynuclears dropped from 60 to 44 per cent. and the lymphocytes rose from 31 to 50 per cent.

On this same day, the rose spots began to disappear, and the early signs of many furuncles appeared on the back and buttocks, due probably to the emaciation and lowered resistance and vitality.

On the thirty-third day of the disease, the procedure of the twenty-ninth was repeated, followed by a severe chill and sweat and a rise of temperature from 102° F. to 106° F. with a subsequent drop in twenty-four hours to 98° F. The furunculosis had sent the white blood cells up to 13,760, with 60 per cent. polynuclears and 34 lymphocytes, and the bacterin sent the count

down to 12,160 with 53 per cent. polynuclears and 45 per cent. lymphocytes. Because of the temperature's failure to come down and stay down, the procedure of the twenty-ninth and thirty-third days was repeated on the thirty-eighth day. This did not cause a chill, but the temperature rose from 99.4° F. to 103° F. followed in twenty-four hours by a drop to 98.6° F. The white blood cells rose from 8240 to 12,480 and the polynuclears from 64 to 71 per cent., while the lymphocytes dropped from 34 to 26 per cent. For the next four days the temperature ranged between 98.4° F. and 102° F., and fell to normal on the forty-third day of the disease and remained there.

CASE II.—J. W., male, white, aged twenty-one years. Admitted to the hospital apparently at the beginning of the third week of the disease (typhoid fever). Widal positive in dilutions of 1 to 40 and 1 to 100.

On the eighteenth day of the disease, the patient was given 200,000,000 of mixed specific sensitized bacterin intravenously. The temperature rose from 103° F. to 106.4° F., and in thirty-six hours fell to 98° F. One-half hour after the bacterin, the white-blood cells had fallen from 8160 to 4720, the polynuclears fell from 62 to 49 per cent., and the lymphocytes rose from 38 to 49 per cent. At this time the spleen and liver were enlarged and the pulse markedly dicrotic. From the twentieth until the twenty-fourth day of the disease, the temperature ranged from 98° F. to 100° F.; after the twenty-fourth day the temperature remained normal. The spleen and liver rapidly decreased in size, until on the twenty-fifth day the spleen was no longer palpable. By this time the dicrotism had also disappeared and the patient was permitted to be out of bed. The convalescence was uneventful and the patient was discharged cured on the thirty-second day.

CASE III.—A. K., male, white, aged twenty-two years. Admitted to the hospital with typical picture of typhoid fever about the tenth day. The spleen and liver were palpable and the pulse markedly dicrotic. Widal positive in dilutions of 1 to 40 and 1 to 100. During the next four days the temperature ranged between 103.2° F. and 105.4° F., and the patient was very toxic. The following day, the thirteenth of the disease, 750,000,000 of a non-specific, non-sensitized bacterin was given intravenously. This was followed by a vigorous chill and a rise of temperature to 106° F., which fell in six hours to 100.2° F. In a half hour the white blood cells rose from 5760 to 6000, while the polynuclears fell from 54 to 52 per cent. and the lymphocytes rose

from 36 to 45 per cent. This changed the type of the temperature entirely, the daily range being from 99.2° F. to 104° F., and the patient was decidedly less toxic. On the nineteenth day of the disease, he was given 2,000,000,000 of a mixed specific sensitized bacterin intravenously. This produced a chill and a rise of temperature to 104.6° F. The white blood cells rose from 6320 to 7040, the polynuclears fell from 42 to 39 per cent., and the lymphocytes rose from 40 to 45 per cent.

On the twenty-first day he was given 1,000,000,000 of a mixed, specific, sensitized bacterin intravenously. This caused a chill and a rise of temperature to 106° F. After eight hours the temperature fell to 104.2° F. and the patient had another chill and rise of temperature to 106.6° F. Nine hours later the temperature had fallen to 97.2° F. One-half hour after the bacterin, the white blood cells dropped from 6080 to 4020 and the polynuclears from 50 to 40 per cent., while the lymphocytes rose from 48 to 55 per cent. Following this, the temperature remained normal, the liver and spleen diminished rapidly in size and the dicotism soon disappeared. Discharged cured on the forty-seventh day.

CASE IV.—A. G., male, white, aged twenty-two years. Admitted to the hospital with symptoms and signs of typhoid fever on the seventh day of the disease. On admission the Widal was negative but came back positive in the 1 to 40 and 1 to 100 dilutions on the tenth. On the fourteenth day of the disease, he was given 750,000,000 non-sensitized, non-specific bacterin intravenously. This was followed by a chill and a rise of temperature to 106.8° F., but it had no effect on the white or differential count. His condition improved and he was less toxic, despite the fact that the temperature remained up.

On the twenty-third day, 2,000,000,000 of a mixed, specific, sensitized bacterin was given intravenously. This produced a chill and a rise of temperature to 107.4° F., followed in six hours by a drop to 99.8° F. In a half hour, the white blood cells fell from 11,120 to 6480 and the polynuclears from 64 to 12 per cent., while the lymphocytes rose from 19 to 70 per cent. Subsequent to the drop in temperature there was a second rise to 105.6° F. followed by a rapid drop to 98° F. during the next thirty-six hours. Here, the twenty-fifth day, the temperature began to rise again and 1,000,000,000 mixed, specific, sensitized bacterin was given intravenously, followed by a chill and a rise of temperature to 103.6° F. After a half hour, the white blood cells fell from 20,240 to 12,480 and the polynuclears dropped from 84 to 76 per cent., while the lympho-

cytes rose from 14 to 20 per cent. The high white blood count at this time was due to a large carbuncle over the left scapula. The convalescence was prolonged by myocarditis, but the patient was discharged cured on the sixty-seventh day of the disease.

Before administration, the bacterin was diluted with 1 c.c. of sterile normal salt solution. Those patients receiving non-specific bacterins were given either the mixed pneumococcic or mixed streptococcic and staphylococcic types. The specific bacterin consisted 250,000,000 each of paratyphoid A and B, and 500,000,000 typhoid organisms to the cubic centimeter; of this a proportionate amount was given.

CONCLUSIONS

1. The dosage should be sufficient to produce a marked reaction—from 125,000,000 up.
2. The type of the bacterin makes no difference, the non-specific acting as well as the specific.
3. The earlier in the disease the bacterin is given, the more effective it is.
4. In favorable cases, the administration of bacterin causes a rapid diminution in the size of the spleen and liver, together with a rapid disappearance of the rose spots and the dicotism. In the less favorable cases, there is a rapid disappearance of the hepatic and splenic enlargements and the rosé spots, but the dicotism persists.
5. In some cases the bacterin actually aborts the disease as shown in the case of J. W. In all cases except those with cardiac dilatation and cyanosis, the disease is strikingly modified and in the majority of instances, cases of the severe type are transformed into milder types.
6. The prime contra-indication to the use of bacterins is a dilated heart—a heart with an increased area of dulness, weak muscular tones, muffled sounds and usually more or less cyanosis.

TWO CASES OF CEREBROSPINAL MENINGITIS

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AND

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THE following two cases of cerebrospinal meningitis are of interest as showing the effect of antimeningococcic serum. The onset in both was preceded by a short period of malaise. Both cases made uneventful and complete recoveries.

The first patient (M. M.) received the first dose of serum on the fourth day of the acute illness and the total amount given was 430 c.c. The response to each dose was much less marked than in the following case.

The second patient (F. F.) received his initial dose on the third day. The full amount given was 45 c.c. and there was marked improvement after each dose.

CASE I.—M. M., female, white, aged eighteen years. Admitted November 29, 1916. Discharged January 13, 1917.

Family History. Eight members of the mother's family died of pulmonary tuberculosis.

Personal History. Usual diseases of childhood including scarlet fever. She has one child four months old, living and well which she was nursing at the time she was taken ill. Menstrual history negative. There has been no history of ear, nose, throat or sinus trouble.

History of Present Illness. Admitted to the hospital on November 29, 1916, with a history of malaise, weakness and anorexia on alternate days for the preceding six weeks; on

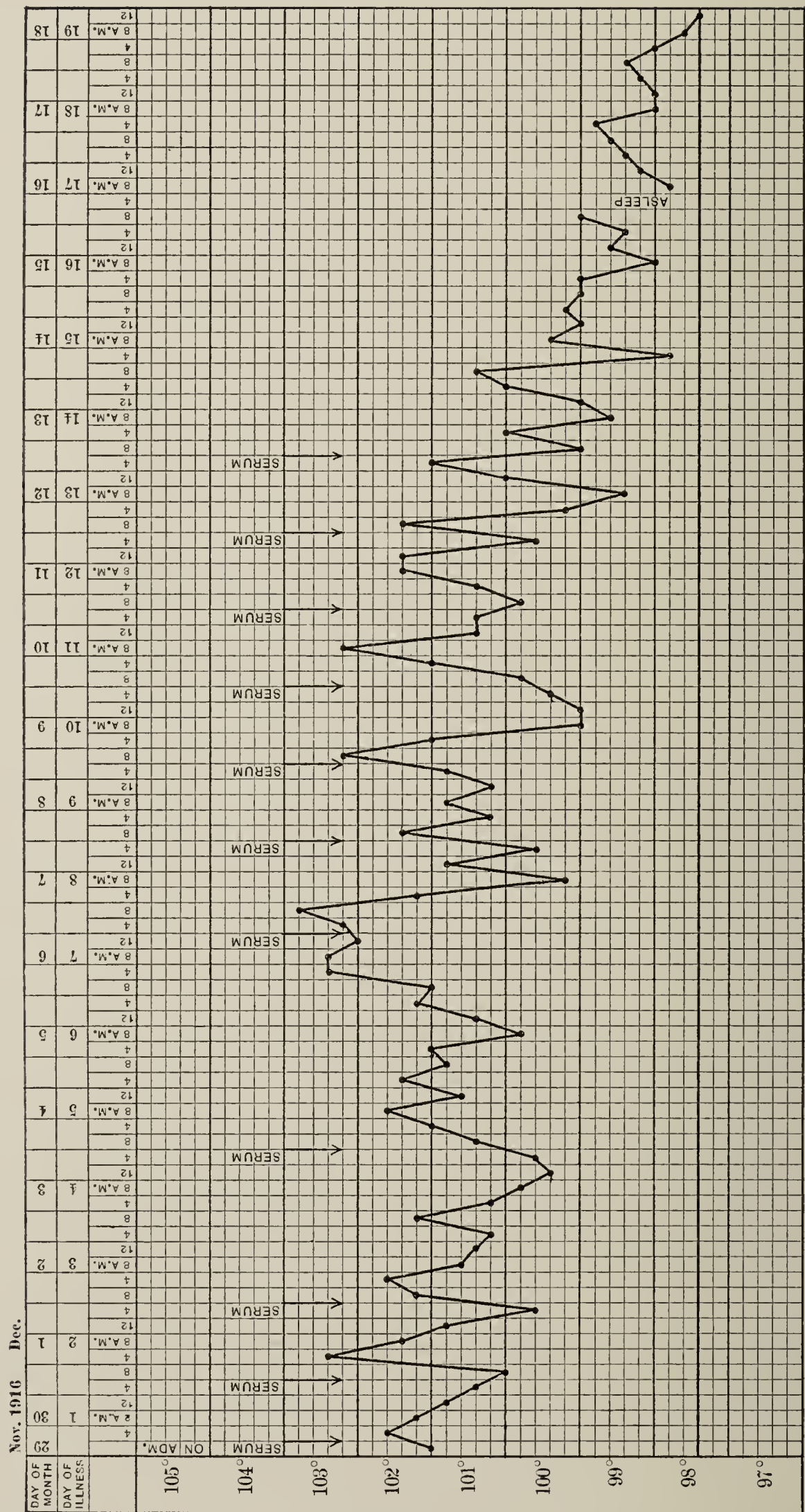


FIG. 22.—Temperature Chart of Case I (cerebrospinal meningitis).

the other days she felt perfectly well. On November 25, she was seized with a headache so severe that she had to go to bed. The headache and weakness were progressive. There were infrequent attacks of vomiting.

On admission, the patient lay on her back with her knees drawn up. She seemed dull mentally but when aroused her responses to questions were clear and accurate. There was no evidence of weakness or paralysis. The biceps, quadriceps extensor and achilles and skin reflexes were all present and normal. There was no change in sensation. There was marked rigidity of the neck but no Kernig or Babinski sign. Otherwise the physical examination was negative.

Spinal puncture was performed and the fluid found to be turbid and under increased pressure; 45 c.c. of this was withdrawn and 60 c.c. of stock antimeningococcic serum introduced into the spinal canal. This procedure gave marked relief from the headache. In addition to this treatment the bowels were regulated, the nose and throat ordered to be sprayed every three hours with liquor alkalinus antisepticus and she was given hexamethylenamine (gr. xv) every four hours. The examination of this spinal fluid showed 8000 cells to the cubic millimeter and of these 72 per cent. were polymorphonuclear leukocytes and 28 per cent. lymphocytes; the globulins were increased and the fluid reduced Fehling's solution. The smear and culture were negative.

November 30. The patient had a comfortable night and there is less headache today. The rigidity of the neck is more marked. There is a well-marked Kernig's sign. The skin reflexes are active and the deep reflexes are normal. Lumbar puncture performed, 35 c.c. of turbid spinal fluid withdrawn and 45 c.c. of antimeningococcic serum given subdurally. This spinal fluid showed a cell count of 10,000 with 90 per cent. polynuclears and 10 per cent. lymphocytes; the smear showed diplococci. The blood count showed 28,000 white cells, of which 78 per cent. were polynuclears, 5 per cent mononuclears, 2 per cent. transitionals, and 15 per cent. lymphocytes.

December 1. Condition unchanged; 25 c.c. of spinal fluid withdrawn and 30 c.c. of serum injected.

December 3. After the withdrawal of 20 c.c. of spinal fluid, 30 c.c. of antimeningococcic serum were given subdurally. The patient is much improved. Her appetite is excellent and she is able to flex her head on her chest and there is less rigidity of the extremities. This spinal fluid was clear in comparison with the

previous specimens and contained 1850 cells to the cubic millimeters, 49 per cent. of which were polynuclears and 51 per cent. lymphocytes; the smear and culture were negative.

December 6. For the past three days the patient seemed to be getting progressively better but today she is much worse. This morning the temperature is elevated, the pain in the head increased and the rigidity of the neck has returned; 30 c.c. of spinal fluid withdrawn and 30 c.c. of antimeningococcic serum given subdurally. The spinal fluid today shows 5200 cells with 85 per cent. polynuclears and 15 per cent. lymphocytes but no organisms were seen. The blood count shows 26,400 white cells.

December 7. The symptoms are all exaggerated today. There is pain in the back of the neck and increased rigidity of the muscles of the legs; 75 c.c. of spinal fluid withdrawn and 75 c.c. of serum given subdurally. An urticarial eruption appeared over the arms, chest and legs today and caused marked itching.

December 8. Thirty-five c.c. of spinal fluid withdrawn and 45 c.c. of serum given subdurally.

December 9. No change in the patient's general condition; 25 c.c. of spinal fluid withdrawn and 30 c.c. of serum given subdurally.

December 10. The patient is very restless today. The signs of the meningitis persist and the pulse is rapid and weak; 25 c.c. of spinal fluid withdrawn and 30 c.c. of serum given subdurally.

December 11. The patient's condition is poor. There is no alleviation of the symptoms; 10 c.c. of spinal fluid withdrawn and 25 c.c. of serum injected.

December 12. For the past two days the spinal fluid has been under low pressure and the amounts of spinal fluid withdrawn have been decreasing. Today 5 c.c. of spinal fluid was withdrawn and 30 c.c. of serum injected. This fluid was tinged with the color of the serum and contained 3750 cells to the cubic millimeter, 91 per cent. of which were polynuclears and the remaining 9 per cent. lymphocytes.

December 13. The patient is irrational, the pulse poor and the neck very rigid.

December 14. Slightly improved.

December 15. Marked improvement. The neck is less rigid, the temperature is lower and the pulse better but the heart sounds are still weak.

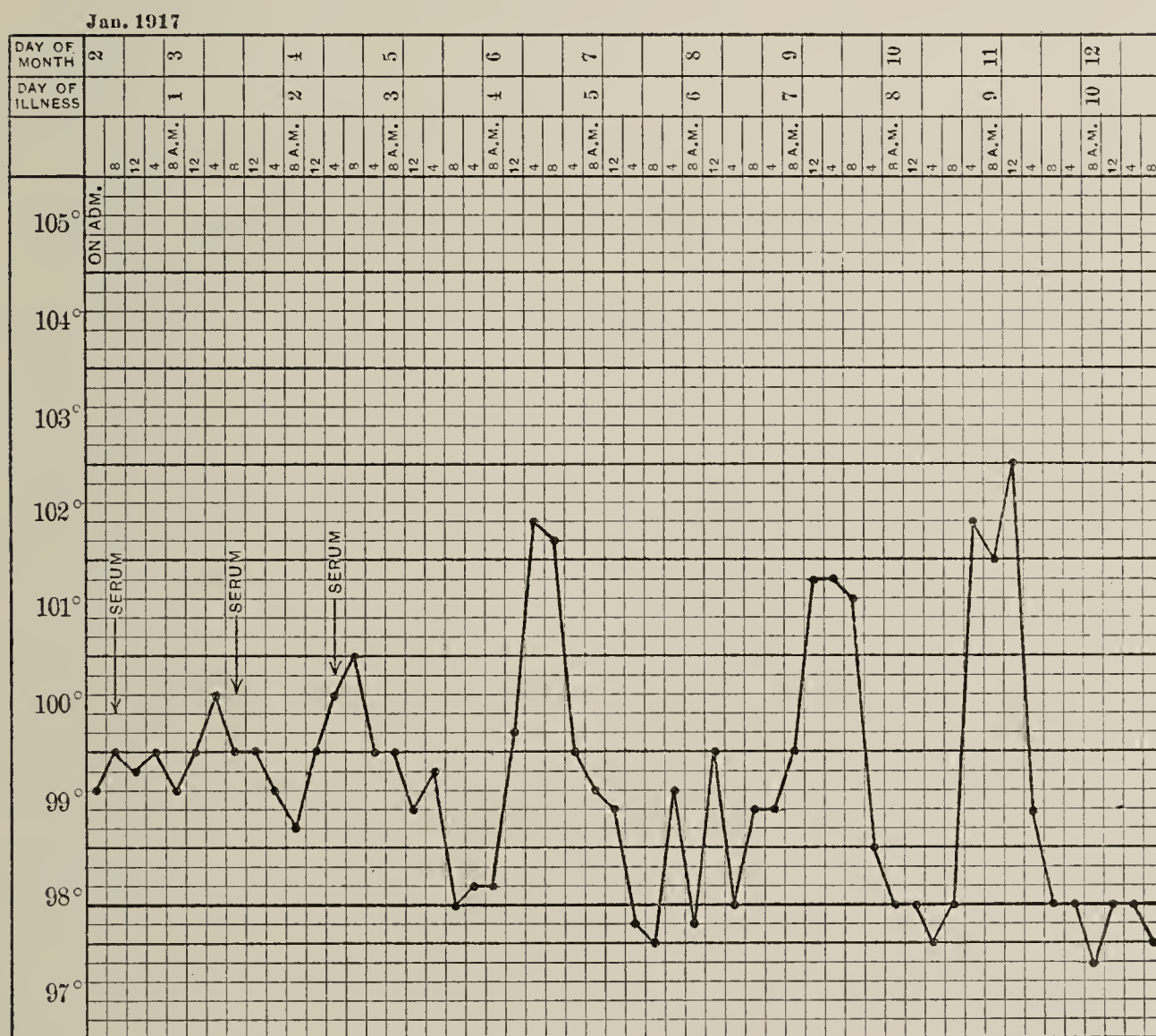
December 17. Patient feels much better. No rigidity of the neck. After this date the convalescence was uneventful except for a slight attack on January 3. The patient was discharged in good condition and without any sequelæ on January 13.

CASE II.—F. F., male, white, aged eight years. Admitted January 2, 1917.

Family History.—Negative.

Personal History. Patient has had measles, mumps and whooping-cough. No history of ear, nose, throat or sinus trouble.

Present Illness. The present trouble began one week ago with headache, constipation and a slight cough. During this time he



tonos. The heart, lungs, and abdomen are negative. The biceps, quadriceps, achilles and skin reflexes are normal. There is a marked Kernig's sign on both sides and any attempt to move the legs causes great pain. Babinski's sign is present on both sides but there is no patellar or ankle clonus. There is marked hyperesthesia of the soles of the feet.

Spinal puncture was performed; 25 c.c. of fluid withdrawn and 15 c.c. of antimeningococcic serum given subdurally. This spinal fluid was of the ground glass variety and on standing ten minutes, there was a deep, yellow sediment in the bottom of the test-tube. There were 36,000 cells to the cubic millimeter and 98 per cent. of these were polynuclears. The globulins were increased and the fluid reduced Fehling's solution. The smear showed many intra- and extracellular diplococci but the culture was negative.

January 3. The only change in the general condition today is the disappearance of Babinski's sign and a slight decrease in the hyperesthesia of the soles of the feet; 25 c.c. of spinal fluid were withdrawn and 15 c.c. of serum given intraspinaly. This fluid, while of the ground glass variety, forms no sediment on standing and the cell count has dropped to 8000. The urine is negative. The blood count shows 30,080 white cells with 77 per cent. polynuclears and 15 per cent. lymphocytes.

January 4. The child feels a little better this morning. He seems brighter and takes more notice of his surroundings. The headache is less severe. He can move his head the least bit without causing any pain. Kernig's sign is less marked; 25 c.c. of spinal fluid withdrawn and 15 c.c. of serum injected. The spinal fluid is now canary yellow in color and much clearer. The cell count is 7760. Intracellular diplococci have disappeared but the extracellular variety are still present in the smear despite the negative culture.

January 5. Marked improvement. The opisthotonos has entirely disappeared and the child is lying quietly and comfortably on his back. The neck is still a little rigid and gives slight pain on motion but is no longer retracted. The legs are not drawn up. Kernig's sign is less marked and eliciting it causes less pain than previously.

January 6. All the symptoms and signs are less marked. The temperature is down to normal.

January 7. The temperature went up to 102.4° F. last night. The only change in the physical signs was the appearance of three small whitish macules about the size of a pinhead surrounded

by a red areola. One of these spots was on the face, a second on the left arm and the third on the chest. These spots disappeared entirely in an hour.

January 9. Temperature lower. There is no rigidity of the neck. A slight Kernig's sign persists. The temperature went up to 101.8° F. this afternoon. This was soon followed by the appearance of an urticarial rash over the face, trunk and extremities.

January 10. The temperature is down to normal again and the rash has disappeared. The general condition is very good.

January 11. The temperature went up to 103° F. today and this was followed by a reappearance of the rash.

January 12. Temperature normal. The rash remains but is less generalized. All the symptoms and signs of meningitis have disappeared.

January 15. General condition good. Temperature remains down. The rash is gradually disappearing.

N. B.—Since going to print, this patient suffered a relapse marked by persistent vomiting. This was finally controlled by gastric lavage and rectal feedings. His recovery, aside from being slow, was uneventful.

REPORT OF A CASE OF PNEUMOCOCCIC MENINGITIS TREATED BY INTRASPINOUS INJECTIONS OF FORMALIN, WITH RECOVERY

By ROYAL E. DURHAM, M.D.
RESIDENT PHYSICIAN IN THE HOSPITAL

THERE have been several cases reported as pneumonia complicated by meningitis, almost all of which have had a fatal termination. This case, however, is worthy of record because of the method of treatment employed and because of the remarkable recovery by which it was attended.

Unfortunately, the patient was Polish, and it was impossible to obtain any family or personal history. The patient was admitted to Dr. W. E. Robertson's service on August 5, 1916. Patient was a white male, aged thirty-eight years. He walked into our Receiving Ward with a temperature of 105° F., and with a markedly staggering gait.

On admission to the ward it was found that the patient was in a low muttering delirium with occasional outbursts of violence, necessitating restraining him in bed. There was marked rigidity of the muscles of the neck and some stiffness of the muscles of the back. There was also some spasticity of the extremities. The pulse was relatively slow, being 88. Pulses were synchronous, regular, and of good volume. The respirations averaged 25. The left pupil was larger than the right one, but both reacted to light. Owing to the patient's condition the reaction of the pupils to accommodation and ocular movements could not be determined.

Examination of the lungs showed that there was but slight impairment of resonance and a slight increase in vocal

fremitus at the right base. Breath sounds were also somewhat harsher at the right than at the left base. Physical findings in the lungs were somewhat vague, however. Examination of the heart and abdomen was negative. All the tendon reflexes were markedly exaggerated. There was, however, no Babinski's sign and no clonus. Kernig's sign could be elicited.

The leukocyte count was 15,120 with 85 per cent. polynuclear leukocytes. Urinalysis was negative with the exception of a faint trace of albumin and an occasional hyaline cast. A lumbar puncture, however, revealed a very turbid spinal fluid under pressure. The spinal fluid contained 500 white cells per cubic millimeter with 94 per cent. polynuclear leukocytes.

I shall now endeavor to portray the progress of the disease as it occurred, from day to day, as follows:

August 6, 1916. Patient shows an extreme degree of toxicity and is but semiconscious.

August 7. Report on blood culture was *Staphylococcus albus*, which was undoubtedly due to contamination from the skin. Today the spinal fluid was turbid and under pressure and showed 463 white cells per cubic millimeter, with 92 per cent. polynuclear leukocytes and 8 per cent. lymphocytes. An extracellular diplococcus, which was demonstrated to be the pneumococcus was found in the spinal fluid. Today the patient was given 125,000,000 of the sensitized mixed pneumococcic sero-bacterins intravenously. This bacterin was composed of pneumococcus, *Streptococcus pyogenes* and *Staphylococcus pyogenes albus* and *aureus*, and was used entirely as a non-specific bacterin. The object here was simply to use the bacterin as a foreign proteose in the blood stream to produce a reaction. Such a reaction would be indicated by a vigorous chill followed by a rise in temperature with a subsequent drop. The chill usually occurs within twenty to thirty minutes after the administration of the bacterin and the whole reaction usually takes place within two to three hours afterward. The more vigorous or sharp the reaction the better are the clinical results obtained. It seems that some bacterins give very much better reactions than others; as, for instance, a colon bacterin seems to produce a better

reaction than a typhoid bacterin. Going under this theory, therefore, these bacterins exert no specific action whatever and are simply used as foreign proteoses to produce a reaction. As to dosage this will vary for different individuals and a large enough dose must be given to exert a reaction. In this case the dose of 125,000,000 did not cause any reaction whatever and was therefore in all probability too small a dose.

August 8. Patient's condition seems very poor. Today the patient was given 1,000,000,000 of the sensitized mixed pneumococcic sero-bacterins intravenously, producing but a slight reaction. Patient also given an intraspinous injection of 10 c.c. of a 1 to 3000 solution of formalin. As formalin is 40 per cent. formaldehyde gas, a 1 to 3000 solution of formalin would be equivalent to a 1 to 7500 solution of formaldehyde. This is administered by tapping the spine; withdrawing about 20 c.c. of spinal fluid and injecting the solution of formalin into the spinal canal through the lumbar puncture needle. The head of the patient is kept elevated for several minutes afterward. This gave no apparent reaction and there were no ill effects whatever.

August 9. This morning the patient was given 2,000,000,000 of the sensitized colon bacterins as a non-specific foreign proteose into the blood stream. This produced a reaction, the patient having a chill and a rise of temperature from 101.2° F. to 105° F. and followed by a drop again to 101° F. This afternoon the patient's condition became very bad. He lapsed into unconsciousness, and his pulse became weak and rapid and the respirations became very shallow. His face was also very dusky and cyanosed and the respiratory rate became increased. Examination of lungs showed that the signs remained the same at the right base. Active stimulation was instituted with atropin, strychnin and camphorated oil. At this time the patient also developed tympanitis with a drum-like distention of the abdomen, for which hot turpentine stupes were applied to the abdomen, asafetida enemas administered and a rectal tube inserted.

August 10. Condition remains unchanged. Spinal fluid still under pressure and turbid, containing 370 white cells per cubic millimeter; 10 c.c. of a 1 to 3000 solution of formalin again injected into the subdural space with no apparent ill results.

August 11. Shows slight improvement. Given 2,000,000,000 of the sensitized colon bacterins intravenously. This was followed by a severe chill and a rise of temperature to 105.3° F. Temperature subsequently dropped to 102° F.

August 12. Abdomen now fairly soft. Stimulation and stupes discontinued.

August 13. Spinal fluid is clearer and under but very slight pressure. Now has 200 white cells per cubic millimeter. The pneumococcus was again demonstrated in the spinal fluid. Spinal injections now increased from 10 to 15 c.c. of a 1 to 3000 solution of formalin, with no bad reaction following. Also again given 2,000,000,000 sensitized colon bacterins intravenously followed by a chill and a rise of temperature to 104.1° F. and a subsequent drop to 99.4° F.

August 14. Has developed a catarrhal conjunctivitis. Breath sounds over right base are harsher than before and resonance a little more impaired. Leukocyte count on the blood is now 15,600 with 77 per cent. polynuclear leukocytes.

August 15. Again given an intraspinous injection of 15 c.c. of a 1 to 2000 solution of formalin, thus increasing the strength of the solution of formalin without apparent harm. This 1 to 2000 solution of formalin is equivalent to a 1 to 5000 solution of formaldehyde. Spinal fluid now becoming clear and is under no pressure. Patient is perfectly limber and there is no muscular rigidity. Has developed, however, incontinence of urine and feces.

August 17. Today patient had a rise of temperature from 99.3° F. to 104.2° F. Herpes appeared on the lips and nose. Pulse-rate and respiratory-rate became increased. Patient became dyspneic and cyanotic. Physical examination now revealed a frank area of consolidation over the right base with marked impairment of resonance, frank tubular breathing and crepitant rales at the end of inspiration. Patient now given enteroclysis of sodium bicarbonate and sodium chloride.

August 20. Signs remain same in lungs. Patient stimulated.

August 21. Intraspinous injection of 15 c.c. of a 1 to 2000 solution of formalin is repeated. Also given 8,000,000,000 of sensitized mixed pneumococcic sero-bacterins intravenously, followed by a severe chill and a rise of temperature to 104.2° F.

August 22. Temperature beginning to fall.

August 23. Temperature slowly dropping by lysis. Signs in lung are clearing up. Patient is mentally clearer. Is still incontinent.

August 24. Temperature normal today for the first time during the illness.

August 26. Temperature is normal. Resolution of consolidated lung taking place. Patient shows great emaciation. Beginning to take nourishment well. Spinal fluid now clear and shows 56 cells per cubic millimeter.

August 31. Condition is now good. Lungs clear. Pulse regular and of good quality. Mentality now good. Urinalysis negative. No incontinence.

September 5. Patient up out of bed.

September 9. Discharged as cured. Before discharging patient examination showed that all the tendon reflexes were very much increased. There was no Babinski sign and no clonus.

There are several interesting aspects of this case.

First to be considered is whether the pneumonia or the meningitis was the primary condition in this case. Osler says that there are many instances of the combination of pneumonia with meningitis, but it does not seem possible to determine whether, in such cases, pneumonia is the primary disease and the meningitis secondary, or *vice versa*. In this case the vague signs in the right base combined with the increased respiratory rate and cyanotic appearance of the patient in all probability meant a central lobar pneumonia, which later on in the course extended to the entire lower lobe of the right lung, thus giving definite and frank physical signs. The pneumococcic meningitis was therefore secondary or complicating the condition in the lungs.

Secondly, the termination of this case in recovery is of vital interest to us as well as to the patient. Osler,¹ in regard to this, said: "Personally I have never recognized recovery in pneumonia complicated by meningitis and the literature of the subject bears out strongly the view, that one of the most striking differences between meningitis of pneumonia and cerebrospinal fever is the almost invariably fatal termination of the meningitis of pneumonia."

Lastly, the treatment employed in this case is an interesting factor. The administration of foreign proteoses into the blood stream and of formalin into the spinal canal may be considered very radical, but this serves to demonstrate that, in extreme conditions, radical measures may often be employed with impunity and be of enormous benefit to the patient.

¹ The Cavendish Lecture on the Etiology and Diagnosis of Cerebrospinal Fever.

HEMATOMA IN THE RECTUS ABDOMINIS MUSCLE, IN A CASE OF PNEUMOCOCCUS SEPTICEMIA¹

By ASTLEY P. C. ASHHURST, M.D.
SURGEON TO THE HOSPITAL

A YOUTH, aged seventeen years, was admitted to the medical wards of the hospital in the service of Dr. George W. Norris, January 16, 1912. His illness had begun on January 13, with pain in the left chest; and on admission there was dulness and bronchial breathing at the base of the left lung. January 18 the leukocyte count was 32,800. I was asked to see the boy January 24. His temperature ran from 103° F. to 104° F., his pulse rate was about 120, and his respirations were from 30 to 38. I was told that he had had a pneumonia at the base of the left lung, with pleural friction. There had been no abdominal symptoms except slight distention for the last several days. His bowels had been opened normally. Recently he was thought to have had pleurisy and perhaps pneumonia in the right lung. There had been no crisis. There were pneumococci in the sputum. The leukocyte count that day was 25,000.

The boy looked desperately ill; he was dyspneic, cyanosed, flushed, but clear in mentality. He could hardly speak, being very hoarse, with constant cough, and expectorating blood-stained muco-pus. The left chest was strapped, and only dry creaking rales could be heard. The right chest was dull high in the axilla, the breath sounds were well heard, and there were numerous very loud, moist and whistling rales. The abdomen was slightly distended all over; deep respiration was impossible without pain and coughing. In the right hypogastric region a poorly defined mass was visible. This was very tender on sudden

¹ Verbal Communication to the Philadelphia Academy of Surgery, October 4, 1915. Reprinted from *Annals of Surgery*, 1916, lxiii, 245.

or deep pressure, and was surrounded by tympanitic areas on all sides. There was slight edema of the overlying skin. There was no cutaneous hyperalgesia. The abdomen was elsewhere flaccid, but slightly distended. Peristaltic sounds were normal. No mass could be felt through the rectum. The bladder was empty.

Under local anesthesia an incision was made over the swelling. On opening the anterior sheath of the rectus there was a discharge of liquid and clotted blood. The fibers of the rectus muscle were destroyed throughout the whole width of the muscle, and for a distance of about 2 inches longitudinally. The parietal peritoneum was then opened, disclosing normal contents. The peritoneum was closed, and the cavity in the rectus muscle was drained with gauze.

The clots removed from the rectus muscle were examined by Dr. C. Y. White, Director of the Pathological Laboratories; muscle fibers were still recognizable in the clot. Cultures of the clotted blood showed "a long chain streptodiplococcus, not the pneumococcus."

The patient died three days later, January 27, 1912. Autopsy showed no peritonitis, but pneumonia and acute parenchymatous nephritis.

This case may well be classed as one of "spontaneous hematoma" of the rectus muscle, presumably due to metastatic infection by hemolytic streptococci.

REPORT OF A CASE OF EARLY TABES DORSALIS

BY IVAN M. PROCTER, M.D.¹
RESIDENT PHYSICIAN IN THE HOSPITAL

K. B., aged twenty-five years, white, male; nativity, United States. Occupation, chauffeur. Admitted September 7, 1916, Episcopal Hospital, service of Dr. Ashhurst. Provisional diagnosis, pylorospasm.

Family History. Negative.

Personal History. Born and lived in North Carolina until one year ago. Past occupation, butcher and waiter in a restaurant. Typhoid fever during childhood; no other diseases up to seven years ago. Soft chancre twelve years ago and an attack of gonorrhea previously. The chancre was burned off but no other treatment administered. Does not recall having had any rash or sore mouth. Uses alcohol in moderation. Seven years ago while working as a waiter in a restaurant, he was taken with a sudden attack of vomiting and severe abdominal pain. The pain was sharp in character and confined to the upper abdomen. It was not accompanied by jaundice or hematuria; it lasted for eight or nine days. Since that time he has had three or four attacks yearly and all of about the same duration. Medicine is without effect. The pain is always accompanied by severe nausea. No voluntary vomiting but induced by passing the index finger down the throat. Occasionally attacks are accompanied by slight precordial pain and moderate pain on micturition. Between attacks he suffers with dull pain in the abdomen, but no vomiting. No girdle sensation. He has slight shooting pains down his legs below the knees. No severe pain in bladder, rectum, or larynx. No loss of sphincter control. Suffers with marked constipation.

¹ History on admission, and ward notes on Surgical Service by Edward T. Crossan, M.D.

He was married seven years ago. Wife has no children; no miscarriages. Married and sexual life apparently normal. First attack of pain six months after marriage. Never had a hypodermic for relief of pain.

Present Illness. Chief complaint, attacks of abdominal pain. One year ago (September, 1915) was operated on at Johns Hopkins Hospital for above-named attacks. No upper abdominal pathology found, but appendix was removed. Attacks have been exaggerated since the operation, and they occur more frequently and are more severe. Readmitted to Johns Hopkins Hospital three months ago (June, 1916) at which time his kidneys and bladder were examined and found normal. Before leaving the hospital he was told that they could find no cause for his attacks. The patient desiring relief came to Philadelphia and wandered into the Episcopal Hospital Receiving Ward.

Condition on Admission. White adult, male, about twenty-five years of age, with a somewhat melancholic expression. Stands with his right shoulder slightly higher than the left.

Eyes: Negative; pupils are equal; react normally to light and accommodation. Ophthalmoscopic examination, negative.

Mouth: Teeth poor; gums receding; throat clear.

Neck: Negative.

Chest: Ribs, interspaces, fossæ and scapulæ are prominent.

Lungs: A small healed tuberculous lesion at the right apex.

Heart: Negative.

Abdomen: Scaphoid; 4-inch scar over right upper rectus from previous operation. No tenderness or rigidity. Spleen and liver not palpable.

Rectal Examination. Moderate relaxation of anal sphincter. Admits two fingers without pain and three fingers with only slight discomfort. No peri-anal anesthesia.

Genitalia: Negative except for a slight scar on dorsum of the corona.

Extremities: Both inguinal and axillary glands are palpable; epitrochlears not felt. Knee-jerks slightly diminished. No Babinski. No ankle or patella clonus. Some incoördination in finger to nose test; none in heel to knee test. Slight swaying to and fro with feet close together and eyes closed. Slight tremor of hands.

Blood-pressure. Systolic, 105; diastolic, 80.

Fractional Gastric Analysis. One-half hour after food: free HCl, 18; combined acids, 18; total, 34. One hour after food: free HCl, 14;

combined acids, 5; total, 34. One and one-half hours after food: free HCl, 22; combined acids, 0; total, 38. Two hours after food: free HCl, 26; combined acids, 12; total, 42.

Microscopic Examination of Gastric Contents. No red blood cells; no white blood cells.

Blood Examination. Hemoglobin, 93 per cent.; red blood cells, 5,100,000; white blood cells, 8800; polynuclears, 68 per cent.; red blood cells normal; no basic degeneration.

Urinalysis. A moderate ring of albumin; a few hyaline and granular casts.

Feces. Ova and parasites negative.

Skiagraph of Stomach and Intestines. Negative except for slight ptosis of transverse colon.

Wassermann Test. (1) Serum: Negative. (2) Spinal fluid: 0.5 dilution plus 1, 1 dilution plus 4, 1.5 dilution plus 4. *Nonne and Noguchi Tests.* Negative. *Fehling's Test.* Positive. The fluid was clear, but under slightly increased pressure; 6 cells per cubic millimeter. Gold solution reaction showed a distinct prearetic curve.

A second blood examination Wassermann showed a plus reaction.

The patient continued to have upper abdominal pain, so on the theory that the crises might be in the intercostal nerves and not in the viscera, the eighth to twelfth left intercostal nerves were injected with alcohol by Dr. Ashhurst September 19, 1916. This produced analgesia in the distribution of the eighth and ninth nerves and the pain was somewhat relieved. Three days later the pain returned and the patient was transferred to the Medical Ward where the tentative diagnosis of tabes dorsalis made by Dr. Ashhurst was confirmed by Dr. W. E. Robertson by means of the gold solution tests of the spinal fluid mentioned above. Anti-syphilitic treatment was immediately begun with daily inunctions of mercury and weekly injections of salvarsan. The first week showed but little change in the patient's condition and on October 7, 1916, the first dose (0.6 gm.) of salvarsan was administered intravenously. Following this there was a distinct reaction. Temperature rose to 102° F with sweating and vomiting. The retching and vomiting continued for twenty-four hours and during that time the patient complained of upper abdominal pain, and shooting pains in his legs. Rested very little. Relieved by gastric lavage and morphin. Condition improved after forty-eight hours but he took very little nourishment during the week and lost 14 pounds in weight. On October 13, 1916, the salvarsan was repeated

without the slightest reaction. On the contrary it cleared up the previous symptoms. The patient was now discharged to return for further treatment.

October 23, 1916. Readmitted for an intravenous injection of salvarsan. As the patient wished to go out the same morning it was thought best to use neosalvarsan; 0.9 gm. of neosalvarsan was dissolved in 25 c.c. of freshly distilled water and injected into the median basilic vein with a Luer syringe. Two minutes after withdrawing the needle, the patient complained of a burning and itching sensation about his face, later about the abdomen and perineum. Signs of acute cardiac dilatation developed quickly and the patient soon lay in a state of profound shock and collapse. The skin was cold, clammy, and sweaty. Face and extremities cyanotic. Pupils markedly dilated. Respirations shallow. Radial and temporal pulses imperceptible. Left border of the heart 3 cm. outside the midclavicular line and no heart sounds were audible.

The patient was given immediately nitroglycerin gr. $\frac{1}{100}$, strychn. sulph. gr. $\frac{1}{30}$, atropin sulph. gr. $\frac{1}{100}$, camphorated oil $\mathfrak{m}\times$, together with an intravenous injection of $\mathfrak{S}\text{xviiij}$ of normal salt solution, and morphin sulph., gr. $\frac{1}{8}$ hypodermically.

After the intravenous injection the patient began to regain color and in thirty-five minutes the heart sounds were audible. Ten minutes later the radial pulses were faintly palpable. The patient's condition rapidly improved and in two hours he was much better, but still quite weak and did not seem to realize that he had been in such a precarious condition. Strychn. sulph., gr. $\frac{1}{30}$, was ordered for him every third hour and continuous enteroclysis. At the end of the week he was free of pain, felt well, and was allowed to go home.

The next dose of salvarsan brought no ill effect but carried with it relief of all pain and apparent good health.

The final (fifth) dose of salvarsan produced a reaction and the patient lay in bed several days complaining of abdominal pain but by the middle of the month (November 15, 1916) he was up and about.

In conclusion we might say that this is an early case of tabes, the diagnosis being confirmed by laboratory findings. This illustrates the value of a most careful examination and laboratory study of all atypical cases. The only symptom in this case was the abdominal pain. At the time of his

discharge the only sign of note was the relaxation of the anal sphincter. This is a comparatively new sign and one that should not be overlooked as it is not without value in the diagnosis of syphilitic lesions of the central nervous system, especially tabes dorsalis and paresis. There is often an associated perianal anesthesia or paresthesia. Another interesting finding in this case was the curve produced in the colloidal gold reaction. The curve was of the preparetic type. The technic of the gold solution test is as follows: Prepare a 0.4 per cent. saline solution using triple distilled water. The third distillate must not come in contact with rubber tubing or metal so that it is electrolyte-free.

Set up eleven small tubes which have been thoroughly cleansed and washed in distilled water. Into the first tube put 1.8 c.c. of the saline solution. Into the remaining ten tubes put 1 c.c. of the saline solution. Into the first tube put 0.2 c.c. of spinal fluid and thoroughly mix the two liquids. Take 1 c.c. of the solution from this tube and pour into the second tube and again thoroughly mix. Take 1 c.c. of the solution from this tube (second) and place in the third tube, and so on up through the tenth tube. The eleventh or last contains only 0.4 per cent. saline solution. Now the first tube contains 0.2 c.c. of spinal fluid, the second tube contains 0.1 c.c. of spinal fluid, the third tube contains 0.05 c.c. of spinal fluid, and so on, each tube containing one-half as much spinal fluid as the tube preceding. So that the tenth tube contained $\frac{1}{2560}$ c.c. of spinal fluid. To each of the eleven tubes is added 5 c.c. of a specially prepared colloidal gold solution, using electrolyte-free water in the preparation.

These tubes are allowed to stand overnight and the reading made the next morning. As a result of the reaction in the different dilutions several colors are formed, a red, red-blue, etc., up to a clear white. These colors when noted in the different tubes produce a curve which makes up our final reading. There are two distinct curves, one seen in tabes

and the ordinary cerebrospinal lues, the other in paresis. This is a very delicate test and often of great value in diagnosis, for it may be found positive when all other reactions are negative.

This case is apparently one in which there is an idiosyncrasy for arsenic. For after the first injection of salvarsan there was a distinct reaction with an exacerbation of the tabetic pain, which rapidly cleared up after the second intravenous. This can be likened unto those patients with tabes (syphilis) who develop an amblyopia after the first dose of salvarsan and are promptly relieved of this complication on administering the second intravenous injection.

The severe reaction following the third dose in this case might be explained in one of two ways: (1) That on the introduction of this powerful drug there was rapid softening of the cerebral vessels with punctiform hemorrhages, and hence the collapse; or (2) the arsenic produced rapid destruction of vast numbers of the specific organisms (*Treponema pallidum*) with the liberation of toxins. As has been observed in the treatment of luetic patients (especially those with involvement of the central nervous system) by arsenical preparations, the second and third doses may produce quite a severe reaction and succeeding doses may be given without any ill effect.

The patient was seen the last time on November 23, 1916. He had returned to his work; suffered no pain and apparently was enjoying good health.

CONGENITAL STENOSIS OF THE PULMONARY ARTERY

By H. G. GODFREY, M.D.
PHYSICIAN TO THE DISPENSARY OF THE HOSPITAL

SINCE January, 1913, there have appeared in Medical Dispensary B. four cases of cardiac disease in children, in which the physical signs were definitely those of stenosis of the pulmonary orifice.

CASE I.—E. F., aged three years, male, white (4519, July 28, 1914).

Chief Complaint is of the heart.

Past History. The first of two children, normal birth, breast-fed for three months; malnutrition later under artificial feeding; weight at the age of six months 6 pounds.

Present Illness. Since six weeks of age he has had cardiac palpitation, dyspnea, and cyanosis of the lips. These symptoms are worse on arising in the morning, after a bowel movement and on any exertion.

Physical Examination. Small child, weighing 24 pounds. Lips purple. Skin dusky.

Heart. Apparent slight hypertrophy, harsh systolic murmur, most intense in midsternal region and best transmitted upward to the left shoulder; no pulmonic second sound; faint systolic thrill. No deformity of the chest.

Lungs. Rales at both bases.

Abdomen. Liver border palpable.

Skiagraph No. 1727 A indicates normal cardiac outline.

October 26, 1916. This boy died suddenly one year ago, twenty-four hours after the onset of some infection of the upper respiratory tract which was accompanied by deep cyanosis and rapid cardiac failure.

CASE II.—M. S., male, white, aged nine years (No. 5639, December 22, 1914).

Chief Complaint. Cough.

Past History. Third child of six, four of whom are living. Normal birth. Breast-fed for one year. He had pertussis (third year), measles and scarlatina (sixth year).

Present Illness. Discoloration of the lips and fingers was noticed in the first six months of life. Diagnosis of a cardiac defect was made in the first year by Dr. Ludwig Loeb. Cough was then and has since been his chief complaint. This is severe, paroxysmal, barking, induced by excitement, overexertion, associated with dyspnea and cyanosis. No epistaxis. Lips and fingers cyanotic.

Physical Examination. Small boy, weighing 50 pounds. Pupils dilated, skin dusky, lips purple, finger-tips blue and slightly clubbed.

Heart. Prolonged, harsh, systolic murmur heard over the entire chest, but best heard to the left of the sternum at the base of the heart, and best transmitted below the left clavicle and over the chest posteriorly; no pulmonic second sound; systolic thrill at the left base of the heart. Very slight cardiac hypertrophy. No deformity of the chest.

Lungs. Negative.

Abdomen. Negative.

October 6, 1916. *Eye examination* (Dr. W. F. Hopkin). Pupils unequal, left larger, pupils react in all directions.

O. D. Nerve vascular with small veins tortuous; veins and arteries of large size; superior anterior artery but little less than the vein in diameter. No pulsation in the veins visible.

O. S. Veins smaller than in O. D.; inferior vein dilated to about the diameter of the artery. Nerve very vascular, showing striation, small veins tortuous. No other fundus changes.

Vision 16/70 in each eye.

October 6. *Blood Examination.* Hemoglobin, 110 per cent. Erythrocytes, 6,960,000. Leukocytes, 20,000.

CASE III.—J. B., male, white, aged nine years (No. 6673, June 18, 1915).

Chief Complaint. Pain in the lower left side of chest.

Past History. First child of five, four living, normal birth, breast-fed twelve months. He was very weak for two months, nursing with difficulty, but later infancy was normal.

Present Illness. He has always been dyspneic on exertion. The skin becomes pallid and ice cold on exertion. There is frequent

nose bleed and cough and precordial pain; appetite good; constipation.

Physical Examination. Well-developed boy. Skin dark, no cyanosis. Musculature good (weight, 61 pounds October 9, 1916).

Heart. Hypertrophy is not marked; apex beat not palpable; a systolic thrill is most marked at the base of the heart to the left of the sternum; a coarse systolic murmur is heard over the entire chest but best in the pulmonic area and is transmitted toward the left shoulder; no pulmonic second sound.

Lungs. Few rales at both bases.

Abdomen. Negative.

October 9, 1916. *Blood Examination.* Hemoglobin, 70 per cent. Erythrocytes, 4,310,000. Leukocytes, 9680.

October 9, 1916. *Eye Examination* (Dr. W. F. Hopkin). Marked venous pulsation. Congenital anterior choroiditis with lipoid deposits in the periphery.

CASE IV.—F. N., female, white, aged three years (No. 7756, January 12, 1916).

Chief Complaint. Cough.

Past History. Second child; normal birth; breast-fed for one year; normal infancy. Measles in second year; pertussis in 1916.

Present Illness. Cough for three weeks only. No dyspnea on exertion. Cough is now paroxysmal. Epistaxis four or five times yearly.

Physical Examination. Child seems active. Weight, 33 pounds. Skin is pallid. Tonsils are hypertrophied.

Heart. Action is regular; faint systolic thrill is palpable over the body of the heart; a loud systolic murmur is heard over the entire precordium; loudest at the left base of the heart and transmitted toward the left shoulder. A faint pulmonic second sound is heard.

Lungs. Few moist rales at both bases.

Abdomen. Negative.

October 24. *Urine.* Negative.

Eye Examination. Vessels not dilated nor tortuous, no pulsation. In the periphery, choroidal, irregular pigmentation, also macular infiltrations, which are small and yellow.

The diagnosis in all of these cases is congenital pulmonary stenosis. Pulmonary stenosis is one of the most common congenital and one of the rarest acquired lesions. It repre-

sents a developmental defect, a deficiency in number of valves and of valvular adhesions more often than a fetal endocarditis.

A patulous ventricular and auricular septum, one or both, are often associated with it. These lesions, along with a patulous ductus arteriosus, are invariably present when atresia of the pulmonary orifice exists.

While cyanosis is the classic symptom of congenital heart lesions, it is well to remember that it is not essential. It may be marked at birth and persistent, or may be transient after exertion, or it may appear only after months or years as a sequel of some infection. Some cases show at all times an unusual pallor.

Polycythemia (Case 2) is characteristic of cyanotic blood.

The examination of the eye-grounds, for which I thank Dr. William F. Hopkin, shows significant vascular changes in two of three cases.

The physical signs may be very sharply defined as follows:

1. A harsh, long systolic murmur, heard over a wide area, heard best over the upper third of the sternum at its left border and transmitted toward the left clavicle.
2. An absent or feeble pulmonic second sound.
3. Slight cardiac hypertrophy or absence of hypertrophy.
4. A systolic thrill at the base of the heart to the left.

In variation from this we may find the systolic murmur transmitted into the great vessels of the neck, according to Carpenter,¹ when the interventricular septum is open. The loud systolic bruit may be absent, particularly is this so before death; the pulmonic second sound may be louder than normal and a systolic thrill absent.

As to the diagnostic significance of the thrill, it is concluded from an analysis in Olser and McCrae's *Modern Medicine*,² that a "thrill is frequently present in pulmonary stenosis when the inter-ventricular septum is entire, and also when a defect of the inter-ventricular septum exists with a patent foramen ovale; when the interauricular septum is closed and the interventricular septum is open a thrill is rare."

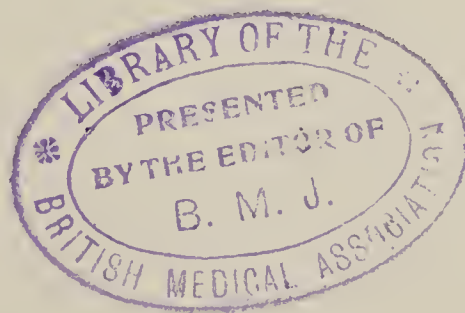
My purpose in presenting these cases is chiefly to point out the favorable prognosis in congenital pulmonary stenosis, relative to congenital heart disease as a whole. Particularly is this so after the first year of life. Case No. 4 is practically symptomless; Case No. 3 is of very good muscular development and normal stature; Case No. 2, despite constant symptoms and stunted physique, has survived measles, pertussis and scarlatina.

Peacock, quoted by Osler,² states that "these constitute 80 per cent. of congenital heart disease surviving the twelfth year." Quoting Carpenter,¹ "It is surprising how minute a channel in the pulmonary artery suffices for life and cases are on record in which the pulmonary circulation has been carried on to adult life with a lumen of only a few lines in diameter."

Most favorable are the cases of simple pulmonary stenosis; least favorable are those in which the ventricular septum is involved.

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BACILLUS AËROGENES CAPSULATUS INFECTION OF SHOULDER; AMPUTATION; RECOVERY

By EDWARD T. CROSSAN, M.D.
RESIDENT PHYSICIAN IN THE HOSPITAL

J. F., aged forty-four years, a laborer, was admitted to the surgical service of Dr. Mutschler on July 29, 1916 and transferred to Dr. Ashhurst on August 1, 1916.

On the day of admission his left upper extremity was caught between two heavy rollers in a brass foundry.

Condition on Admission. Adult, male, very well nourished, suffering severe pain.

Head: Eyes, normal; nose, small laceration on the left side at the root of the nose; mouth, small laceration on the right side of the mucous membrane of upper lip.

Neck: No adenopathy.

Chest: Very well formed, expansion good and equal. On the left side of the chest there is a laceration commencing at the level of the seventh rib in the posterior axillary line, terminating just in front of the anterior axillary line at the level of the tenth rib and involving all the tissues down to the ribs; this was closed on the ward by six interrupted fine silkworm gut sutures. No fracture of ribs.

Lungs: Normal.

Heart: Normal.

Abdomen: Good musculature. No masses or signs of injury.

Extremities: Left upper. Laceration on the inner surface of the upper extremity, extending from about 2 inches below the head of the humerus, down on the forearm for a distance of 5 inches. All the muscles beneath the wound are exposed, but they are so badly torn that their identification is impossible, with the exception of the proximal end of the biceps which is very prominent in the wound. Nerve ends are plainly visible, but so

badly distorted that the individual nerves cannot be recognized. The brachial artery lies quite close to the wound and it seems to be intact, although pulsations in it can only be felt half way down the arm. There is an oblique fracture at the middle of the humerus, with the fragments overlapping. Internal condyle of humerus and the end of the ulna are plainly seen in the wound.

There is no pulsation in the radial artery, nor any pain sensation in the hand or forearm excepting the tip of the thumb, where some sensation still remains. There are small lacerations over all the terminal phalanges, and also one in the dorsum of hand in the first metacarpal interspace. No fracture of the bones of forearm or hand.

After admission to the ward the fracture was reduced. Arm was abducted to 90 degrees, Buck's extension straps applied as far as the elbow and 10 pounds of traction applied. The wounds were allowed to remain open, and were treated by a continuous irrigation of peroxide.

July 31. The weights were removed as they caused severe pain in the affected member. On July 30 given 1500 units of tetanus antitoxin. At this time there is no pulsation either in the radial or the brachial arteries; the whole extremity is cold and gives forth an offensive odor.

August 1. Patient seems very dull, and there is a more offensive stench around the left upper extremity. Operated on.

Operation (by Dr. Ashhurst). Arm prepared with tincture of green soap, alcohol and bichloride. External and internal flaps fashioned, the external flap is the longer, the lowermost margin being about 6 inches below the greater tuberosity. On making the incision for the outer flap, some gas bubbles seemed to escape from the wound and although the muscles had an abnormally grayish tint, there was no crepitation and it was decided that some mistake had been made. The extremity was first removed at the site of fracture, following which the proximal fragment of the humerus was exposed up to and slightly above the insertion of the deltoid and removed at that point. One mattress suture was taken through the muscles, at the anterior and posterior angles of the wound, and the ends tied over a rubber drainage tube passed through the wound. The subcutaneous tissues at the middle of the outer flap had a grayish hue, and these were cauterized by 95 per cent. phenol. Skin closed by six interrupted silkworm gut sutures, thus permitting gaping of the wound edges for drainage. The patient reacted from the operation very well.

August 2. Morning. There is a very offensive odor around the stump and the dressings are saturated with a thin, foul-smelling exudate, but there is no pus present. Drainage tube washed out and a fluid similar to that on the dressings recovered. There was some crepitation noticed at the lower margin of the inner flap, but after the expression of some fluid this seemed to disappear. Temperature slightly elevated.

Afternoon. Patient is very dull, there is still an offensive odor around the stump and temperature has risen to 103.1° at 4 P.M. The arm was dressed and then it was ascertained that there was marked crepitation all over the end of the stump, on the inner side extending up into the axilla. All the stitches were removed and then it was seen that all the muscles were of a mottled gray and were crepitant. The stump was left exposed to the air and the peroxide drip resumed.

August 3. The crepitation has not extended beyond the end of the bone on the outer side. There is still an offensive odor and a thin exudate but no pus. Temperature remains around 103° F. White blood cells, 8240.

August 4. Laboratory reports culture positive for *Bacillus aërogenes capsulatus*.

Afternoon. Temperature 101° F.; white blood cells, 6400. Crepitation disappearing in axilla and the patient is much brighter. Brachial artery exposed.

August 7. Afternoon. Temperature 101° F.; the whole wound surface is of a uniform gray color. The crepitation is disappearing. Still on peroxide drip and tinct. iodine (U. S. P.) applied to wound twice daily.

August 12. No crepitation in flaps but there is still some in the muscle ends. Affected tissues are beginning to slough away. Temperature normal since August 8.

August 17. All sloughing tissues cut away. No crepitation now. Temperature normal.

September 2. Discharged with a granulating wound about 2 inches in diameter and 1 inch deep.

GUNSHOT WOUND OF THE CAROTID ARTERY

By E. G. ALEXANDER, M.D.
ASSOCIATE SURGEON TO THE HOSPITAL

LIGATION of the innominate artery was first performed by Valentine Mott in 1818. The first successful case on record was operated on by Smythe in 1864.

Excellent articles, with case reports, on this subject by Sheen, Burns, Thompson and Hamann have been written within the past few years.

As ligation of the innominate artery for aneurysm or injury has only been performed a few times, I wish to place on record a case which I had recently at the Episcopal Hospital.

G. K., white, aged twenty-six years, a policeman, was admitted to the Episcopal Hospital on August 6, 1916, with the following history:

He was being shown by a fellow officer how to work a new automatic revolver when it was accidentally discharged, the bullet striking him in the neck. He was immediately rushed to the Episcopal Hospital in a patrol wagon.

An examination on admission showed the following:

A well-developed man, 5 feet 10 inches in height, and weighing 175 pounds. He was bleeding considerably from a gunshot wound of the neck. The wound was on the right side of the neck $1\frac{1}{2}$ inches above the clavicle and $1\frac{1}{2}$ inches to the right of the median line. There was a large swelling on the right side of the neck that extended from the clavicle almost to the angle of the jaw. The trachea was pushed over to the left and on a line with the angle of the jaw. There were periodic discharges of a considerable quantity of blood from the wound, and with each of these discharges the size of the swelling in the neck was appreciably

diminished. The patient was slightly shocked, dyspneic, cyanotic and emitting a frothy mucus from the mouth. He could only speak in a whisper. An examination of the heart, lungs, abdomen and extremities was negative. There was no wound of exit but the bullet could be felt subcutaneously to the right of the vertebral border of the left scapula and about on a line with the fourth rib.

The patient was immediately taken to the operating room and operated upon under ether anesthesia plus the administration hypodermatically of morphin sulphate, grain $\frac{1}{4}$, and atropin sulphate, grain $\frac{1}{150}$.

An incision was made along the anterior border of the sternocleidomastoid. The tissue was so infiltrated with blood that the usual landmarks of the neck could not be made out. As the incision was deepened and immediately on opening the deep fascia blood gushed forth in a continuous stream. As the flow of blood was so profuse it was impossible to locate any structure or bleeding points. The wound was therefore rapidly enlarged down to the clavicle. Hemostatic forceps were then thrust at random into the wound and clamped, gauze sponges were also packed into the wound. These two procedures controlled the bleeding to a certain extent. By rapidly removing the gauze packs and quickly inserting another I was able to locate the bleeding point, which proved to be from the lower angle of the wound underneath the clavicle. Long curved hemostats were clamped in the wound underneath the clavicle where the bleeding seemed to be coming from. After several attempts the bleeding was controlled.

As the patient had lost a large quantity of blood his condition was most serious. An intravenous injection of normal salt solution and adrenalin was given.

As many hemostats were clamped in the wound the next step consisted in removing as many as possible and ligating the bleeding points. Hemostat after hemostat was removed until only a few remained and these were over the line of the common carotid and innominate arteries. The tissues were then exposed and it was found that these arteries were clamped. The carotid was ligated and the hemostats on it removed. There still remained three long curved hemostats underneath the clavicle, and as it was impossible to pass a ligature around them it was decided to leave them as clamped. The intravenous failed to show any beneficial effects, as the patient was blanched and pulseless. It seemed as if he would die on the table. The officer who accidentally did the shooting was fortunately at hand, and after explaining the

patient's condition to him he readily consented to give some of his blood. A transfusion of 750 c.c. was done by the Kimpton-Brown method. The patient's condition immediately improved. He gained some color and it soon became possible to feel his pulse.

The wound was closed with the three curved hemostats left *in situ*, supported by a small packing of gauze. The patient was sent to his bed greatly shocked.

August 6, 1916. After operation: Patient greatly shocked. Recovered from ether quickly, complains of little pain, given stimulation and started on enteroclysis.

7.00 P.M. Temperature 102° F., pulse 126, respirations 28. Pulse of much better quality. Given hypodermoclysis, 1 pint every six hours.

August 7. Kept mildly under the influence of morphin sulphate. Had a fair night. Can speak only in a whisper. Pulse rapid. Temperature 103.3° F. Takes enteroclysis poorly. Complains of intense thirst.

August 8. Temperature down, pulse better, respirations slower. Kept under the influence of morphin sulphate.

August 9. Given water by mouth, enteroclysis given intermittently. Lies quietly on back. Dressings, which were blood soaked, changed.

August 10. Temperature 99° F., pulse 100. Very quiet, lying on back. No pain. Condition satisfactory.

August 13. Taken to operating room and hemostats unclamped, but as bleeding began they were reclamped.

August 14. Has developed pain in the left chest, friction rub is heard.

August 16. Pleurisy better.

August 17. Taken to operating room and hemostats unlocked, slight bleeding resulted. This was controlled by lightly packing the wound with gauze.

August 21. Patient taken to operating room and hemostats removed. Slight bleeding again occurred which was controlled by packing. Still has pain in the left chest. Has developed a few rales.

August 22. Bled a small amount last night which was controlled by pressure. Has developed a pulsating tumor under the line of incision.

August 23. Bled from the wound again last night, controlled by packing.

August 24. Pulse suddenly became worse and the patient died in a few minutes.

An autopsy was performed by the Coroner's Physician and it was found that the bullet had taken the following course: Entering the right side of the neck $1\frac{1}{2}$ inches above the clavicle and $1\frac{1}{2}$ inches to the right of the middle line, it passed down and back partially severing the carotid at its junction with the innominate, it then passed through the edge of the third dorsal vertebra, pierced the fourth rib, and lodged underneath the skin as previously described.

In the wound in the neck was a large traumatic aneurysm. In the left thorax was a pint of fresh blood and it was the opinion of the one performing the autopsy that death was due to this hemorrhage and that it was caused by a rupture of the fourth intercostal artery. The rupture of this artery was due to a spicule of bone on the fourth rib.

Thompson¹ in an excellent article entitled "Ligation of the Innominate Artery for Cure of Subclavian Aneurysm," reports a case of his own, reviews the literature on the subject and records in detail all cases operated on for ligation of the innominate since 1880.

A summary of the total number of cases operated upon, as collected by Thompson, is as follows:

	Cases.	Recovered.	Died.
Ligation of the innominate alone	35	7	28
Ligation of the innominate and carotid simultaneously	15	9	6
Ligation of the innominate, carotid and vertebral simultaneously	2	0	2
	52	16	36

Since Thompson's article, Carl A. Hamann² reports 2 cases as follows:

CASE I.—*Subclavian Aneurysm*. Colored male, aged twenty-five years. Operation, ligation of innominate and common carotid. At time article appeared, which was two months after the operation, the patient was well.

CASE II.—Female, aged fifty-nine years. A fusiform aneurysm of the innominate at its junction with the common carotid and subclavian. Operation, ligation of the innominate. The patient died the fourth day after operation of cerebral anemia.

¹ Southern Surg. and Gynec. Trans., 1914, xxvii, 110.

² Cleveland Med. Jour., 1916, xv, 221.

Nearly all the cases reported were operated upon for spontaneous aneurysm, and the remaining few for traumatic aneurysm or injury to the artery.

Harte¹ reports a case of injury to the common carotid due to a pistol wound. The innominate and common carotid were ligated in this case.

Lewtas, Hernandez and Saigo report cases of injury to the carotid and subclavian, requiring ligature of the innominate.

Of the 52 cases collected by Thompson, 41 were operated on for spontaneous aneurysm, 6 for traumatic aneurysm, and 5 for wounds of large arterial trunks. Of this number, 16 recovered.

Secondary hemorrhage and cerebral anemia were the most frequent causes of death.

A summary of the cases reported in the literature up to date and including my own case is as follows:

	Cases.	Recovered.	Died.
Ligation of innominate alone	36	7	29
Ligation of innominate and carotid simultaneously	17	10	7
Ligation of innominate, carotid and vertebral simultaneously	2	0	2
	55	17	38

¹ Ann. Surg., 1897, xxvi, 488.

A METHOD OF SKIN GRAFTING

BY IRVINE M. BOYKIN, M.D.
CHIEF RESIDENT PHYSICIAN IN THE HOSPITAL

SKIN grafting, though one of the simplest of operations, does not always give the desired results. On looking for the defect it is likely to be found in one of several places: (1) In preparation of the denuded part; (2) in the type of graft used; and (3), and most important of all, in the after-treatment.

Having had a good many burn and shell wound cases under my care during a stay of six months at the Ambulance of the American Hospital in Paris, I had the opportunity to try all the methods of skin grafting and to study the results of each. The results were in many cases discouraging. It was a matter of necessity to hurry on the healing of large raw areas so that the patients could be discharged to make room for more. To accomplish this it was necessary to overcome the defects by finding a means by which the field could be made ready for grafting, to find a type of graft that would give better results and to find a plan of postoperative treatment to assure the end-results.

In studying the cases that were a failure it was concluded that to graft a suppurating surface was a waste of time, as the grafts would be floated off. This included wounds that were producing pus from the surface or from a sinus leading from the deeper tissues. It was noticed that wounds bathed in pus did not heal in from the edges, but as soon as the pus diminished the process of healing began. So following Nature's advice this was used for a sign as to when to attempt grafting.

As regards the type of graft used, all were tried out with very varying results, but as a rule unsatisfactory. The Wolfe graft was least satisfactory of all, as it seldom "took" and also because the area from which it was taken often had to be grafted in turn. The Réverdin graft "took" very well, but the process was tedious if the area was large. Having a potential growth of only $\frac{1}{4}$ of an inch in diameter or less the granulations often came up between and covered the graft. The film of epidermis is so thin from this graft that it was not uncommon to have it break down. The same conditions were met with when the Ollier-Thiersch method was used.

Lack of attention to after-treatment not infrequently resulted in failure. The chief trouble here was allowing pressure to be made on the grafts by letting the patient assume any position he desired. This also caused the grafts to be shifted from their original position, which markedly lessens the chances of "taking."

Having found where the fault lay in the methods above mentioned, an endeavor was made to come upon a plan of procedure by which the defects could be remedied. In the following paragraphs this method is described in detail. So far as the writer is able to ascertain it has never been used before.

The wound should be cleansed thoroughly with soap and water and all crusts from the edges removed. Alcohol and ether are then used to remove any grease that may be left behind. A 2 per cent. solution of soda bicarbonate is then applied in the form of fomentations, and these should be changed often enough to keep them warm. These fomentations are continued until the granulations are pus-free and the epidermis begins to grow in from the periphery. It may be well to mention here that soda bicarbonate is used because it retards bacterial growth in the strength used, at the same time is not detrimental to the tissues. It also prevents crusts from forming.

Just as soon as the fomentations are stopped the wound should be grafted. The area from which the grafts are taken, preferably the anterior surface of the thigh, is shaved and prepared by the scrubbing method. Iodin is to be avoided. Local anesthesia is advantageous in that the patient can be controlled after the operation, hence diminishing the danger of disturbing the grafts, as is not the case when the patient is reacting from general anesthesia. Novocain in strength of 1 per cent. solution is very satisfactory, the writer having used as much as $1\frac{1}{2}$ ounces of this solution without any untoward symptoms.

The graft used resembles the Wolfe graft in that it includes the entire depth of the skin, but differing from that type in that it is multiple instead of one graft covering the entire surface. In size it is about that of the little finger nail. The grafts are removed by lifting the skin with a long straight needle, making enough tension so that when the cone of skin thus formed is cut the deepest layer is included. A very sharp scalpel is preferable to scissors, as the latter traumatises the edges of the graft from which the growth begins. The grafts are placed on the granulating surface so that not more than $\frac{1}{2}$ inch of space is left in all directions. It is obvious that, the less the distance between grafts the quicker the healing and less the contraction. Care should be taken in removing the grafts to leave a narrow strip of skin between each cut. If this is done there are left many small wounds, instead of one large one, and these take but a short time to heal.

The area, having been covered with grafts, is now dressed. Next to the grafts is placed a piece of paraffin gauze, which should extend well over the edges of the wound. This gauze is made by dipping mosquito netting in melted paraffin, care being taken not to let the film of paraffin occlude the pores. On top of this are placed a few layers of gauze saturated with 2 per cent. solution of soda bicarbonate. A few dry dressings are then applied over this, and are held in place by a bandage loose enough to avoid pressure. The next step,

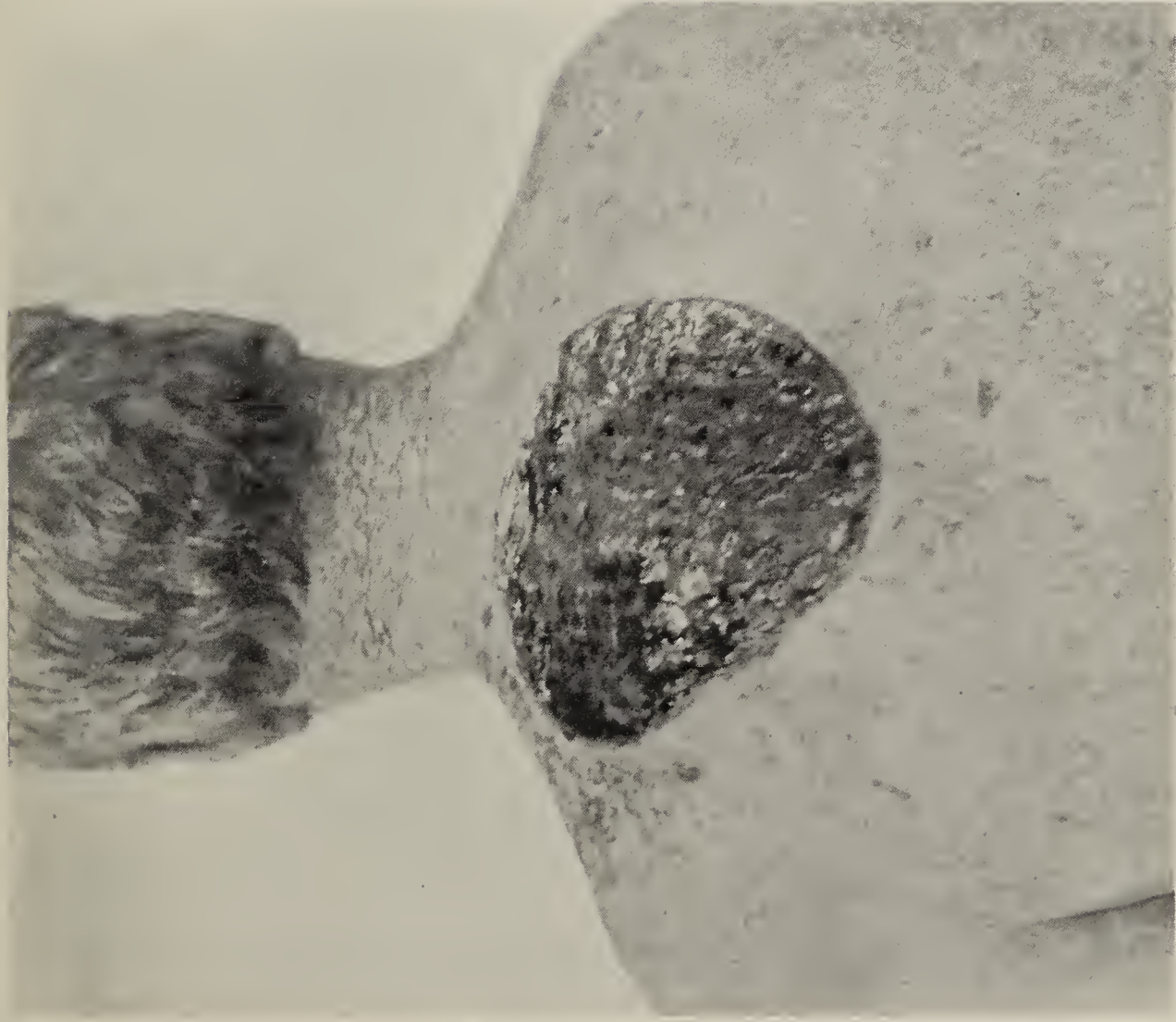


FIG. 24.—Case III. Granulating wound sixteen days after excision of carbuncle (October 20, 1916).

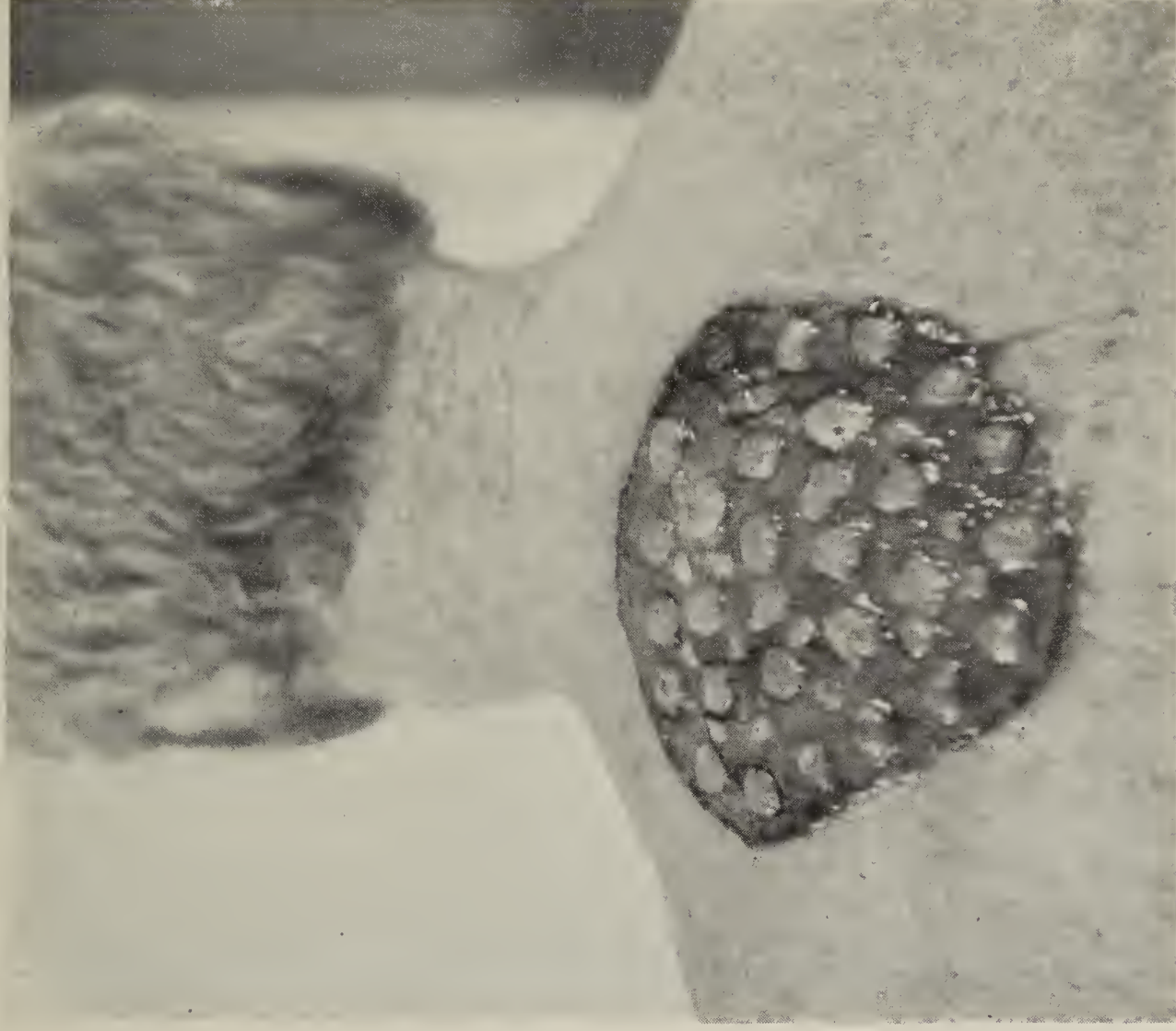


FIG. 25.—Case III. Four days after skin grafting (November 4, 1916).



FIG. 26.—Case III. Grafts beginning to coalesce (November 10, 1916).



FIG. 27.—Case III. Twenty-seven days after skin grafting; epidermization complete (November 27, 1916).



FIG. 28.—Case IV. Five weeks after injury (November 27, 1916).

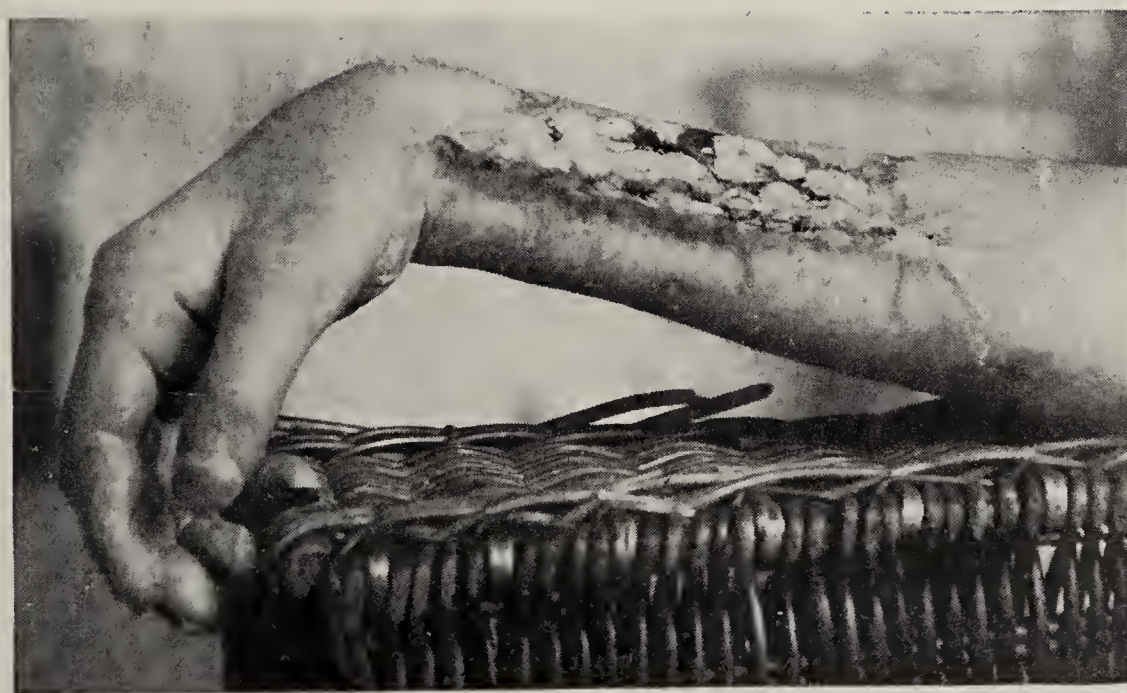


FIG. 29.—Case IV. Sixteen days after skin grafting (January 22, 1917).

and it is an important one, is to immobilize the part if necessary. If this cannot be done the patient should have special watching. The original dressing need not be changed for at least four days, unless the wound begins to suppurate again. Should the pus saturate the dressings they can be replaced by fresh ones without changing the paraffin gauze. At the end of four days the grafts are firmly attached and the entire dressing can be removed. The area should then be exposed to light, either sun or artificial, enough moisture being applied at intervals to prevent crustation from occurring. As a rule, I have exposed them during the day, and applied wet dressing during the night. Once the graft has taken a good result is almost certain.

By no means is the method claimed as an infallible one, but from the results obtained from its use it does appear to be more satisfactory than the older methods.

To Dr. Astley P. C. Ashhurst I am indebted for the privilege of using this method on 5 cases in his wards. On 3 of them the results were excellent, 1 being a chronic leg ulcer of three years' duration, another being an area on the back from which a carbuncle had been excised and the third a case of burn of the axilla. The second case was a chronic leg ulcer on which the results were only fair. The fourth case was a complete failure at the first two attempts, the reason for which I am inclined to believe was due to grafting in the presence of too much pus. The third attempt, however, was a complete success.

CASE I.—M. K., aged forty-nine years, admitted to the hospital March 17, 1916. Diagnosis: "Callous ulcer of leg." Duration of ulcer three years. It extended entirely around the circumference of the leg. Scarcely any improvement during the five months that the patient was in the ward before operation.

August 5, 1916. Operation. All grafts "took." Patient discharged October 7 with the ulcer entirely healed.

October 25. Returned for examination and leg found to be in good condition.

CASE II.—R. C., aged sixty-nine years. Admitted to hospital September 23, 1916, a chunk of the calf muscles having been cut out by a machinery crush. In a month the granulating surface (10 x 7 cm.) was ready for grafting.

October 27, 1916. Operation. Thirty grafts were removed from the thigh and transplanted on ulcer. Out of thirty, twenty grafts "took."

December 20, 1916. The ulcer at the present time has not completely healed, an area about 0.5 cm. in diameter being still uncovered by skin.

CASE III.—C. O'H., aged fifty-four years. Admitted to hospital October 3, 1916 with diagnosis of carbuncle of back.

October 4. Carbuncle excised. Area allowed to granulate until October 24, when it was grafted. Thirty-five grafts used. None of these "took," as they were displaced by movement of the patient.

October 31. The area was again grafted with forty-eight grafts, all of which "took." Patient discharged on December 2 with area entirely healed (Figs. 24, 25, 26, 27).

CASE IV.—J. F., aged fifty-two years. Admitted to hospital October 21, 1916, with diagnosis of lacerated forearm. The entire flexor surface of the right forearm was denuded by a machinery accident. Primary operation done to suture severed nerves and tendons. Wound could not be closed owing to wide destruction of skin surface, and had to be allowed to granulate.

November 28. Wound was grafted in the presence of much pus. Sixty-two grafts used. All sloughed.

December 4. Another operation performed with the same results. To be operated on again when suppuration has ceased.

January 6, 1917. Patient operated on for the third time. All grafts took (Figs. 28 and 29). Patient discharged January 31 with the wound entirely healed, by a supple painless scar.

CASE V.—L. K., aged nine years, admitted to hospital November 22, 1916, with a diagnosis of burns of right axilla.

November 31. Cast applied to chest and right arm, holding the arm at right angles to the body, but leaving the denuded area open.

December 1. Patient operated on. Twenty-five grafts removed from the leg and placed over the burned area; half this number took. Patient discharged January 27, 1917, with wound healed with the exception of several areas about the size of a dime.



END-RESULTS OF FRACTURES OF THE FOREARM

By EDWIN P. LONGAKER, M.D.

ASSISTANT IN THE AURAL AND LARYNGEAL DEPARTMENT OF THE HOSPITAL

THE following report is based upon the study of patients with fractures occurring in 1915 (a few prior to this), presenting themselves for treatment at the Episcopal Hospital. The work was done for the Committee on Fractures of the American Surgical Association, under the direction of Dr. Astley P. C. Ashhurst, to whom I am greatly indebted for the privilege of studying the cases.

The method of treatment, measurements of all fractures, *x*-rays of as many as possible, records of *x*-rays before and after reduction, and after union; the number of days spent in the hospital; the number of hours before reduction; whether anatomical reposition of the fragments was obtained, and other minor points were noted. In many of the cases *x*-ray reports are missing, never having been recorded in the histories, but most of them had *x*-ray reports recorded after the reduction. The usual methods of treatment were used in most of the cases, and little attention will be given to them in this paper, though several points will be emphasized.

In the group "Functional Results," "good" means no disability whatever, the patients having no symptoms; "moderate" means a mild degree of disability, manifested by pain, interference with joint function, endurance, etc. A "bad" functional result is a useless member or a very severe degree of disability.

In all, 389 patients were requested to return for examination; of this number 185, or 47 per cent., were patients with fractures of the forearm (radius, 116 cases, or 29 per cent.; ulna, 69 cases, or 17 per cent. of the total number). Of this total number (185) of patients with fractures of the forearm, 86, or 46 per cent., returned for examination.

RADIUS										Cases.
Colles's	.	.	.	.	.	.	.	.	.	33
Head	.	.	.	.	.	.	.	.	.	3
Upper third	.	.	.	.	.	.	.	.	.	3
Middle third	.	.	.	.	.	.	.	.	.	7
Lower third	.	.	.	.	.	.	.	.	.	8
Epiphyseal separation	.	.	.	.	.	.	.	.	.	2
Total										56

ULNA										
With fracture of radius	.	.	.	.	.	.	.	.	.	22
Alone	.	.	.	.	.	.	.	.	.	8
Total										30
Styloid process (alone, 1; with radius, 12)										13
Olecranon	.	.	.	.	.	.	.	.	.	1
Upper third	.	.	.	.	.	.	.	.	.	4
Middle	.	.	.	.	.	.	.	.	.	5
Lower third	.	.	.	.	.	.	.	.	.	7
Total										30

There were 82 simple, and only 4 compound fractures among those examined:

Simple	{	Radius	.	.	.	54	Compound	{	Radius	.	.	2
		Ulna	.	.	.	28			Ulna	.	.	2

Of all the fractures examined 35 per cent. were of the radius: 21 per cent. of those examined were Colles's; and 37 per cent. of the latter were accompanied by fracture of the styloid process of the ulna.

The following tables show the number of fractures according to the age and sex of the patient:

ULNA

Years.	Number of cases.	Male.	Female.	Right.	Left.
0 to 15	14	11	3	8	6
16 to 45	7	5	2	3	4
46 to 60	5	1	4	4	1
Over 60	4	2	2	2	2
Total	30	19	11	17	13

RADIUS

Years.	Number of cases.	Male.	Female.	Right.	Left.
0 to 15	28	25	3	16	12
16 to 45	16	13	3	10	6
46 to 60	6	2	4	5	1
Over 60	6	3	3	4	2
Total	56	43	13	35	21

RADIUS (COLLES'S)

Years.	Number of cases.	Male.	Female.	Right.	Left.
0 to 15	12	12	0	8	4
16 to 45	11	8	3	7	4
46 to 60	5	3	2	3	2
Over 60	5	3	2	3	2
Total	33	26	7	21	12

The most interesting facts in this group are that the greater number of the fractures in the forearm occurred in the male, before the age of sixteen years, and in the right arm; 62 of the 86, or 72 per cent., were in the male; in the ulna 19, or 63 per cent.; and in the radius 43, or 76 per cent. Before the age of sixteen, 42 of the 86, or 49 per cent.; in the ulna 14 out of 30, or 47 per cent.; in the radius 28 out of 56, or 50 per cent.

I believe this is accounted for by the fact that boys are much more active than are girls, that they are rougher in their play, and much more reckless. The Colles's were grouped separately because of the high percentage of this type of fracture.

GENERAL RESULTS

<i>Anatomical</i>		
	Non-operative.	Operative.
Good	46 (57 per cent.)	2 (40 per cent.)
Moderate	17 (20 ")	2 (40 ")
Bad	18 (22 ")	1 (20 ")
Total	81	5

<i>Functional</i>		
	Non-operative.	Operative.
Good	57 (70 per cent.)	2 (40 per cent.)
Moderate	19 (23 ")	2 (40 ")
Bad	5 (6 ")	1 (20 ")
Total	81	5

The following table is inserted for comparison. It is adapted from Table XI in the "Report of the Committee on Fractures of the American Surgical Association for 1915."

GENERAL RESULTS (FRACTURES OF RADIUS AND ULNA)

<i>Anatomical</i>		
	Non-operative.	Operative.
Good	39 (60 per cent.)	21 (68 per cent.)
Moderate	18 (28 ")	5 (18 ")
Bad	8 (12 ")	1 (4 ")
Total	65	27

<i>Functional</i>		
	Non-operative.	Operative.
Good	57 (88 per cent.)	19 (70 per cent.)
Moderate	2 (3 ")	7 (26 ")
Bad	6 (9 ")	1 (4 ")
Total	65	27

Our operative cases were too few to base any definite opinion on. The non-operative list is interesting in that our series showed 20 per cent. giving moderate anatomy and 23 per cent. giving moderate function, and the American Surgical Association Report gives 28 per cent. moderate anatomy and 3 per cent. moderate function. The cases of "bad" anatomy

in our series were 22 per cent., and 6 per cent. “bad” function; the American Surgical Report, 12 per cent. “bad” anatomy and 9 per cent. “bad” function.

There were 3 fractures of the head of the radius, all in males; the oldest patient, thirty-seven years, had 2 displaced fragments of the head excised soon after the injury, with resultant moderate function; one of the boys had a good anatomical and functional result; the other, limited extension (130 degrees) and normal flexion. In neither of these cases were the fragments displaced and no operation was done. The remaining fractures not especially outlined were fairly evenly distributed.

There were 6 fractures of the shaft of the radius which had no accompanying fracture of the ulna; 11 had fractures of both shafts; 1 of the cases of epiphyseal separation of the radius occurred in conjunction with a fracture of the ulna, the other independent of it.

Fractures of the Ulna. Anatomical Results

	Styloid (with radius) one epiph. sep.	Styloid (alone).	Shaft of Ulna (with radius).	Shaft (alone).
Good	5	1	5	3
Moderate . . .	3	0	3	2
Bad	4	0	2	2
Total	12	1	10	7

Fractures of the Ulna. Functional Results

	Styloid (with radius) one epiph. sep.	Styloid (alone).	Shaft of Ulna; (with radius).	Shaft (alone).
Good	8	0	6	4
Moderate . . .	3	1	3	3
Bad	1	0	1	7
Total	12	1	10	7

In the 12 fractures of the styloid with added fracture of the radius, 10 of which were Colles’s, we could not blame the poor results on the styloid; in the single fracture of the styloid the anatomy was good but there was occasional pain, and the endurance was not perfect twelve months after injury.

In the shaft of the radius and ulna there were 2 having bad anatomy with moderate function; 2 moderate anatomy with good function, and 1 having good anatomy with bad function, this one having an ischemic contracture. In the fractures of the shaft of the ulna alone, there were 2 having bad anatomy with moderate function, 1 of which was never reduced, the other not maintained after reduction; another had moderate anatomy with good function, another, moderate anatomy and moderate function, the last being the single fracture of the olecranon.

Fractures of the Radius. Anatomical Results

	Colles's.	Head.	Epiph. sep.	Shaft (alone).	Shaft with) Ulna).
Good . . .	19	2	2	5	6
Moderate . .	5	1	0	2	3
Bad . . .	9	0	0	0	2
Total . . .	33	3	2	7	11

Fractures of the Radius. Functional Results

	Colles's.	Head.	Epiph. sep.	Shaft (alone).	Shaft with) Ulna).
Good . . .	24	1	2	6	8
Moderate . .	6	2	0	1	2
Bad . . .	3	0	0	0	1
Total . . .	33	3	2	7	11

The notable point here is that there are 9 bad anatomical results in Colles's fracture with only 3 bad functional. Three of the cases of bad anatomy showed good function; 3 with bad anatomy showed moderate function; 2 cases with moderate anatomy showed good function; 3 cases of bad anatomy all showed bad function, 1 of which was corrected by operation, screws being inserted after reduction and thereby good anatomy and function obtained. Three had moderate anatomy with moderate function.

The 3 cases of the head of the radius as noted above had good anatomy in 2 cases, 1 of which had moderate function; the other, good. The third had moderate anatomy and moderate function.

In the fractures of the shaft of the radius alone, there were 7 cases, 2 of the shafts of both bones. In the former there were no bad results, 2 had moderate anatomy and 1 of these had good function.

In the 11 fractures of the shaft of the radius and ulna combined, 5 had good anatomy with good function, 2 had bad anatomy, estimated by deformity, with moderate function; 2 had moderate anatomy with good function; 1, moderate anatomy with moderate function; 1 had good anatomy as far as the bones were concerned, but function was bad, there being an ischemic contracture, mentioned above, with limitation of joint function and the disability was practically complete.

OPERATIVE CASES			
Age, Years.	Radius.	Ulna.	Time of operation.
11 (male)	0	1	5 days after injury
11 (female)	0	1	8 weeks " "
37 (male)	1	0	5 days " "
38 (male)	1	0	11 weeks " "
60 (female)	1	0	3 months "
Total	3	2	

RESULT			
<i>Anatomical</i>		<i>Functional</i>	
Good.	2	Good	2
Moderate	2	Moderate	2
Bad	1	Bad	1

The boy had the ulna plated five days after the fracture occurred, resultant good anatomy and function. The girl had a dislocated head of the radius complicating the fracture of the ulna; she obtained moderate function: flexion, 60 degrees, and full extension. The man, aged thirty-seven years, had an excision of fragments of the head of the radius with resultant moderate function; the second man, aged thirty-eight years, had a bad anatomy and function changed to good by operating eleven weeks after the injury; the last case, a woman, aged sixty years, had screws inserted three months after injury with no improvement in the condition, she had bad anatomy and bad function.

AVERAGE PERIOD OF DISABILITY											
<i>Simple Fractures</i>											
											Weeks.
Operative cases	.	.	.	.	.	.	.	.	.	.	12½
Non-operative cases	.	.	.	.	.	.	.	.	.	.	11⅓
Age, Years.											Weeks.
0 to 15	.	.	.	.	.	.	.	.	.	.	6
16 to 45	.	.	.	.	.	.	.	.	.	.	8
46 to 60	.	.	.	.	.	.	.	.	.	.	16
Over 60	.	.	.	.	.	.	.	.	.	.	22

Compound Fractures. Two cases, with an average period of disability of five months. There were two compound of the ulna and two of the radius; one patient, aged sixty-six years, had a compound fracture of the lower third of the ulna and radius with bad anatomical and functional result, and a period of disability of nine months; the other was in a boy, aged twelve years, a compound Colles's and styloid of the ulna, with resultant good anatomy and function, and one month's disability. The first case was not reduced and anatomical reposition of the fragments was not obtained.

As to the period of disability in the operative cases, one patient was not operated upon until eight weeks after the injury, another eleven weeks, 1 at five days, and 1 at three months. The period of disability would have been shorter, I believe, had earlier operation been performed.

In the non-operative cases the older the patient the longer the period of disability.

Now why do we get bad end-results? In going over the cases we find that many of the fractures are not properly reduced when they first apply for treatment, which may be at any time of day or night; in the second place if they have been properly reduced, in some, the reduction is not maintained until they visit the clinic or dispensaries one or two days later. Though the number of operative cases is very small in this report, and the end-results not especially good, I believe that if the fragments cannot be maintained in proper position they should have an open reduction and fixation, except possibly in children. Most of our cases in

which poor anatomy was obtained with good function accompanying them were in children, and I would say that the importance of securing good anatomy in order to obtain good function increases with the age of the patient. With greater care and more careful treatment more cases should get proper reduction. This can be better and sooner accomplished by having a special fracture clinic in charge of a man well trained in this branch of surgery.

Even though the report shows that quite a few fractures with bad anatomical result will give good or moderate functional result, it should be our aim to secure both good anatomy and function.

Most of the patients presented themselves soon after the injury, and this is another reason why good diagnosis and treatment should be accomplished. Very few cases showed limitation of joint function.

In a hasty glance over some end-results in fractures occurring in 1916, we are struck with the marked improvements over those of 1915.

In the cases listed in this paper there were 4 patients whose arms were of no use to them in trying to follow their former occupation. Three patients were able to earn one-half as much as before the fracture, while 3 others could earn only three-fourths as much. It was hard to estimate the efficiency of most of the patients, because their work was not dependent upon the injured member.

SUMMARY. 1. I would say that the end-results are not especially good.

2. By studying the end-results we will be better able to remedy or to improve upon our faults.

3. Fractures should go to a special fracture clinic when applying for treatment as free patients in a hospital, and be seen at the first visit by a well-trained man.

4. There is an increasing interest in the treatment of fractures, being brought about by the American Surgical Association, by taking up the study of end-results.

MULTIPLE CARTILAGINOUS EXOSTOSES (HEREDITARY DEFORMING CHONDRODYSPLASIA),
WITH NOTES OF NINE HITHERTO
UNPUBLISHED CASES¹

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THE clinical entity which goes under the name of multiple cartilaginous exostoses has recently been studied by Ehrenfried, who prefers the name hereditary deforming chondrodysplasia. According to Rendu and Levy its relation to chondrodysplasia was recognized by Ollier as long ago as 1899. G. G. Davis says it was described as a clinical entity by Cæsar Hawkins, in 1837. Ehrenfried found only about 12 cases which have been reported in America, the greatest number being reported from Germany and France. Inasmuch, however, as I have myself had the opportunity to see no less than eleven such patients within the last ten years it is evident that the affection is not really rare, but merely has been ignored, because there is so little that can be done in the way of treatment.

The affection is more frequent in males than in females, is distinctly hereditary, may be transmitted by both affected males and females, but there is no good evidence that it may be transmitted by unaffected males, though it may be transmitted by unaffected females (Reinicke, 1890; Lippert, 1903). The essence of the disease is not the exostoses; these are

¹ Read before the Philadelphia Academy of Surgery, October 4, 1915. Reprinted from *Annals of Surgery*, 1916, i, 167.

merely incidental (Lenormant, 1905). This has received especial recognition since the more common use of x-rays, but was suggested by Ollier and others long before the advent of skiagraphy. As a matter of fact, the underlying pathological change is a chondrodysplasia, affecting especially the metaphyses of the long bones, though the bones of the pelvis, the clavicles, scapulæ and the vertebræ may be involved also. In skiagraphs the bone ends may look cystic (Fig. 31), owing to irregularly distributed areas of cartilage in the metaphyses. The epiphysis itself is small or misshapen, the intermediary cartilage is narrow, irregular, oblique, or zigzag, and sometimes prematurely ossified (Lenormant, 1905). Scattered along the ends of the shaft beneath the periosteum are to be found clumps or nests of cartilage cells persisting uncalcified where they were left in the process of growth. Later these groups may develop into cartilaginous exostoses or chondromas (Ehrenfried, 1915).

Certain secondary characteristics usually but not always are present, and are easily recognized (Bessel Hagen, 1891). These are a low stature, due to shortness, not of the trunk, but of the limbs; as a rule, the lower limbs are more shortened than the upper. There often is a lack of growth of the ulna, resulting in relative overgrowth in length of the radius, which becomes luxated at one or both ends, especially at the elbow. Thus the condition has been mistaken for "congenital dislocation of the radius," and according to Bessel Hagen most cases so described really were cases of this dyschondroplastic affection and in no sense instances of a congenital dislocation. *Pes valgus* is a frequent development from lack of growth of the fibula, with relative overgrowth of the tibia.

The deformities above enumerated may come before the exostoses, and the latter may never develop. Exostoses may develop in cases of very slight or insignificant deformities; or exostoses may be present on undeformed bones while the same patient may have other bones which are deformed but without exostoses.

Occasionally a malignant osteocartilaginous tumor develops in one of the exostoses. Ehrenfried says Lenormant and Lecéne collected 24 such cases, and he has himself found references to about a dozen more.

Patients usually come under observation at or about puberty, for pes valgus, for painful pressure by one or more exostoses, or for general bone pains. After skeletal maturity the disease usually ceases to progress; but in the remarkable case reported by G. G. Davis (recorded below as Case 10) a man who had had exostoses since childhood began to develop new tumors when past fifty years of age, after a quiescent period of more than thirty years. In the patient recorded below as Case 8, moreover, there is no certain knowledge of the existence of the exostoses before the age of thirty years. But if we remember that exostoses are incidental features of the affection, there is no reason, so far as I can see, to deny the possibility of their appearing for the first time in adult life.

I give below a brief abstract of the cases which have been under my own observation. Unfortunately the hereditary character of the disease is not very apparent in this series, most patients denying that any other members of their family were similarly affected. But it is very likely that closer investigation might have discovered some such cases.

CASE I.—Ella C. M., aged four years, was referred to the Orthopedic Service of the Episcopal Hospital by Dr. Henry Winsor and Dr. James W. Ellis, September 20, 1915. This girl is her parents' only child; the mother has had no other pregnancies. The parents are both healthy, and the family history is otherwise negative. The child was normal at birth. From the age of eleven to twenty months she suffered from enteritis, and had an intercurrent attack of measles at the age of one year. Since then she has been healthy, with the exception of an attack of varicella about three months before coming under observation.

About one year before seen by Dr. Ashhurst, the child fell and bruised her left knee. When her mother came to rub it for her she found a lump on the outer side above the knee. No



FIG. 30.—Case III Multiple cartilaginous exostoses in a negro girl of eleven years.



FIG. 31.—Case VII. Multiple cartilaginous exostoses. The mass in left side of neck has caused paresis of ulnar nerve. Note involvement of vertebral border of scapula, exostosis on upper metaphysis of humerus and cystic (cartilaginous) appearance of underlying bone.



FIG. 32.—Case VII. Multiple cartilaginous exostoses.



FIG. 33.—Case XIV. Exostosis above internal condyle of femur.

further trouble was experienced, and it was not until about six or seven months later that the mother noticed similar bony lumps on the upper part of the left humerus and at the right elbow.

Examination at the present time shows a fairly well-developed and nourished child, with no subjective symptoms. The mother thinks the lumps have not increased in size much if at all since they were first noticed. There are exostoses in the following locations: Two on the spine of the right scapula, one on the upper angle of the left scapula, one on the fifth right rib, near its cartilage; one on the upper end of each humerus, that on the right apparently arising from the lesser tuberosity, and that on the left from the greater tuberosity; one on the upper end of the right ulna, inner side; one above the external condyle on the left femur; one above the external malleolus of the left fibula.

The head of the right radius is unduly prominent, as if subluxated.

Many skiagraphs were taken, but as the child was very refractory and would not be still, none of them are sufficiently good to be reproduced as half-tone illustrations.

CASE II.—Philip W., aged twenty years, seen in Dr. Davis's service at the Orthopedic Hospital, April 17, 1906 (Book xviii, p. 118). Exostoses first noticed at age of three months. There are now exostoses on nearly all the bones; in both forearms the radii are longer than the ulnæ, and the hands deviate to the ulnar side. There is moderate valgus in both feet.

CASE III.—Edna U., aged eleven years, negress. Seen in my dispensary service at the Children's Hospital, August 13, 1907. There are four other healthy children, and so far as known no one else in family has any similar affection. No history of tuberculosis. The patient began to walk at age of nine months, and so far as family knew was perfectly normal until three years ago, when exostoses began to appear, and have been growing larger since. She comes for pains in her bones. The photograph (Fig. 30) shows many of the exostoses. The right radius was 21 cm. in length, and the left 18.5 cm. There is some shortening of the ulnæ, and slight valgus in both feet from deformities in the leg. She was under treatment at this time for seven months, and her pains lessened while taking the syrup of iodide of iron. Three years later she was seen at the Orthopædic Hospital, in Dr. Davis's service, for pronounced valgus in both feet. As the condition was painful, braces were ordered including the legs.

CASE IV.—Fred R., aged seventeen years, was seen in Dr. Davis's service at the Orthopædic Hospital, November 12, 1907

(Book xx, p. 14). The family history is recorded as negative. The boy had had typhoid fever in 1897, when eight years old. About one year later he first noticed an exostosis over the upper inner end of left tibia. One year later a similar growth appeared in a corresponding situation on the right leg. Then gradually others formed all over the long bones. The left knee is markedly bowed (outward). The right lower extremity measures 88 cm., and the left 91 cm., being longer than the right in spite of the bowing of the knee.

CASE V.—Henry B., fifteen years, was seen in Dr. Davis's service at the Orthopædic Hospital, January 21, 1908 (Book xx, p. 62). His brother, with the same affection, is recorded below as Case VI. Another brother, also said to have multiple exostoses, was not seen. Henry has had the affection for seven or eight years, and for five years had to wear leg braces on account of pain and weakness. There are exostoses on all long bones, on both clavicles, both scapulæ and on the pelvis, but none on the hands or feet.

CASE VI.—Mason B., aged thirteen years, seen in Dr. Harte's service at the Orthopædic Hospital, March 19, 1908 (Book xiii, p. 58). Two brothers have multiple exostoses. One is recorded above as Case V. Mason has noticed the present condition about two years. He comes for valgus deformity in both feet. The right leg, from knee to ankle is 1.5 cm. shorter than the left.

CASE VII.—Herbert T., aged fourteen years, seen in Dr. Harte's service at the Orthopædic Hospital, February 11, 1909 (Book xiii, p. 215). The boy came for weakness in the left arm, which had existed for a year. There was paralysis of the left ulnar nerve, evidently due to pressure of a bony mass in the neck (Fig. 31). Over this mass there was a keloid scar from an operation performed four months previously in another hospital. So far no improvement had followed this operation. There were also exostoses of the right humerus, left femur, left tibia and fibula. A photograph (Fig. 32) shows considerable valgus deformity in the feet, and moderate shortening of the upper extremities, and some of the lower extremities, as the mid-point of stature is not at the pubis, but half way between it and the umbilicus.

CASE VIII.—Alexander M., aged thirty years, seen in Dr. Davis's service at the Orthopædic Hospital, June 8, 1909 (Book xxii, p. 19). The family history is negative. The patient had never been ill, and denies all venereal disease. The present complaint was noticed after what he calls an attack of "rheuma-

tism" for which he says he was treated from December, 1908, to March, 1909. Until the latter date he did not know of the existence of any exostoses. At this time Dr. Davis removed an exostosis from the left femur, which was pressing on the sciatic nerve (possibly the cause of his "rheumatism" during the winter), and one from the left fibula.

CASE IX.—Mary R. B., aged seven years, seen in Dr. Davis's service at the Orthopædic Hospital, August 10, 1909 (Book xxii, p. 84). The exostoses were noticed before the child was one year of age. They are present on all four extremities, on the scapulæ, and one is forming on the left ribs. The child was brought for pronated feet.

I have also seen two patients reported by Dr. Davis in the monograph already mentioned:

CASE X.—A man, aged fifty-three years, whose exostoses began to appear when he was about ten years old. After the age of fifteen or sixteen years, the disease became more or less stationary, except for gradual impairment of joint motion. At the age of fifty-two years an exostosis developed on the left ramus of the pubis; this growth subsequently grew smaller while the patient was under Dr. Davis's observation. The man suffered from considerable pain in his bones, and was incapacitated for work. A photograph published by Dr. Davis, as well as numerous skiagraphs, shows the typical deformities characteristic of the disease, namely, relative shortening of ulnæ, with ulnar deviation of the hands, and subluxation of the head of the left radius; right knock-knee, and valgus in both feet.

CASE XI.—A child (sex not recorded), aged three years, with exostoses, which were first recognized by the mother before the child was one year old. The digital phalanges were involved as well as all the long bones of the limbs. The child also was rhachitic, and knock-knees were present.

There are also brief records at the Orthopædic Hospital of the following two patients, in Dr. W. J. Taylor's service. They did not come under my personal observation:

CASE XII.—Edward S., aged sixteen years, January 26, 1907 (Book xiii, p. 12). Has had knock-knee since childhood; had typhoid fever four years ago. Has several exostoses on or near each knee.

CASE XIII.—Hugh McN., aged thirty-four years, March 5, 1910 (Book xv, p. 31). Has presented symptoms due to exostoses for two years. Exostoses are present at right wrist, left elbow, and left scapula.

Owing to lack of details it is not certain that these cases (XII and XIII) are instances of hereditary deforming chondrodysplasia. But the more one looks into the matter, the more difficult does it become to draw any definite lines between well-defined "typical" cases and those which are just on the verge of typical. At the other end of the scale come those patients who present one or at most two or three exostoses, which have developed without any evident cause, or have been discovered after a slight injury which may or may not have been an etiological factor. These patients present no indication of any hereditary affection, and no skeletal deformities are noticed. It is, of course, possible that in such cases a thorough skiagraphic examination might reveal evidences of chondrodysplasia in bones showing no other evidences of disease, or might even show other insignificant exostoses.

The following cases, for instance, are to my mind examples of chondrodysplasia of some sort:

CASE XIV.—Annie S., aged sixteen years, was seen in Dr. Harte's service at the Orthopædic Hospital, July 27, 1911. Two years previously she had struck her left thigh against the runner of a sled, and three months later a bony lump appeared. She complained of pain in the lower part of her left thigh when walking. The lump was a typical cancellous exostosis, springing from the femur above the internal condyle (Fig. 33), and I excised it with the cortex from which it sprang, September 7, 1911.

CASE XV.—Jennie F., aged thirteen years, referred to my service at the Episcopal Hospital by Dr. R. S. Hooker, in May, 1914. A bony lump had been noticed at the right shoulder for three weeks; there was no history of injury. The exostosis, springing from the humerus and presenting beneath the anterior fibers of the deltoid muscle, was excised with the underlying cortex, May 13, 1914 (Fig. 34). There has been no recurrence to date.

CASE XVI.—Grace J., aged fourteen years, came to my service at the Orthopædic Hospital, October 31, 1914. About September

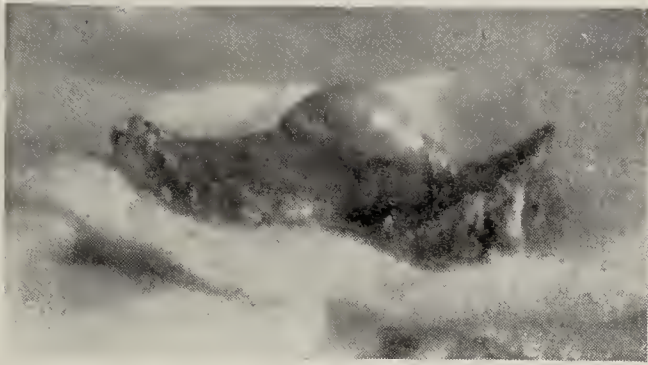


FIG. 34.—Case XV. Exostosis excised from humerus.



FIG. 35.—Case XVII. Traumatic hyperostosis of the humerus, four months after a fall on elbow.

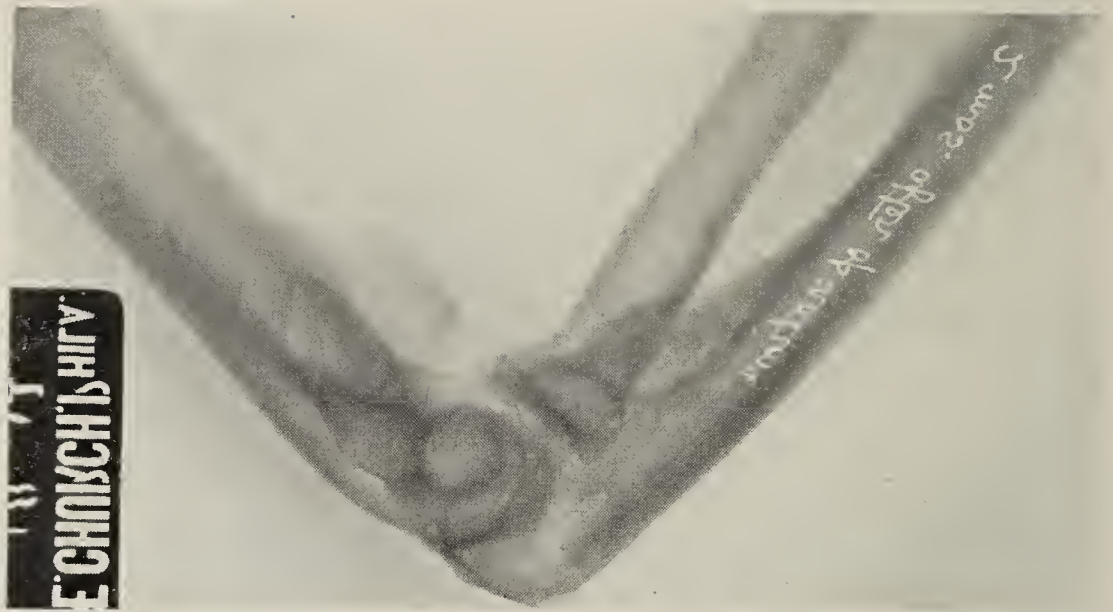


FIG. 36.—Case XVII. Recurrence of hyperostosis of humerus two months after operation.



FIG. 37.—Case XVII. Gradual absorption of new-formed bone, nine months after operation.

1, 1914, she had fallen on the stairs, and twisted her shoulder in the banisters. About a month later she noticed a lump on the right scapula. This caused pain, and seemed to be growing larger. On December 12, 1914, I excised it. It sprang from the upper vertebral angle, and the portion of bone from which it grew was removed in one piece with it, including the entire thickness of the scapula. Recovery was uneventful. About four months later the girl returned, complaining of neuralgic pains beneath the right pectoralis minor, and shooting back to the scapula. Skiagraph showed no bony lesion. The girl was referred to the nervous department of the hospital for an opinion, and Dr. F. W. Sinkler reported that he considered her neurasthenic. At all events she recovered from her pains without further surgical treatment.

Two utterly different types of cases, it seems to me, are those recorded by me in the remaining pages of this article—one a traumatic hyperostosis, the other an instance of osteophyte accompanying chronic hypertrophic arthritis.

CASE XVII.—*Traumatic hyperostosis of the left humerus, recurring after operation, but eventually disappearing spontaneously.*

Mary D., aged twenty-four years, was seen in the Orthopædic Service of the Episcopal Hospital, June 1, 1914. Four months previously she had fallen down ten steps, landing on her left elbow. Her physician said it was dislocated, but an *x*-ray showed no bone lesion. It was bandaged for some weeks, but remained painful.

When examined at the Episcopal Hospital, four months after the accident, there was marked disability, with constant pain in and above the elbow. There was full extension and normal rotation, but flexion of the elbow was stopped by bony contact at 80 degrees. A bony mass could be felt in the flexure of the elbow a little to the median side of the midline between the condyles. An *x*-ray showed a mass of bone in the flexure of the elbow (Fig. 35) apparently arising from the humerus, possibly from the muscle. The patient readily consented to have the excessive bone removed by operation, as she was unable to do her work (housework).

Operation (June 29, 1914).—Under Esmarch anemia a longitudinal incision was made along the median edge of the biceps muscle, displacing the brachial vessels and median nerve to the median side. This gave ready access to the growth, which, as shown by the *x*-ray, sprang from the humerus, nearer its median

than its lateral border. The growth extended down to the trochlear surface. It was covered by periosteum which appeared normal, and did not in any way involve the muscles. The mass with its overlying periosteum was removed by gouge and mallet, until the normal contours of the humerus were restored, and normal flexion of the elbow was possible.

The pathological report, by Dr. C. Y. White, Director of the Pathological Laboratories of the Hospital, stated that the specimen was composed of cancellous bone containing areas of granulation tissue.

July 20. Elbow flexes further than before operation. A bony mass is still felt over the lower anterior part of the humerus.

August 3. Flexion to 65 degrees and full extension.

August 31. Flexion to 60 degrees. Some pain in damp weather. X-ray shows recurrence of bony growth in flexure of elbow (Fig. 36).

March 8, 1915. Nine months after operation. Flexion to 50 degrees, extension normal. Never any pain or disability. X-ray shows scarcely any thickening of the shaft at the site of the former hyperostosis (Fig. 37).

CASE XVIII.—*Osteophytes of humerus, accompanying chronic arthritis of the shoulder; excision with permanent relief of symptoms.*

John C., aged sixty-two years, broom-maker. Blind since age of twelve years, as the result, he says, of an attack of typhus fever. He was seen in the Orthopædic Service of the Episcopal Hospital, August 5, 1913. About fifteen years previously he had fallen and injured his right shoulder, and it has given him constant discomfort since. In December, 1912, this shoulder gave a sudden crack while at his work of making brooms, and he had been unable to work at all subsequently until the present, on account of the pain in his shoulder on any motion.

Examination showed a well-preserved but thin old man, not at all robust. There was no limit to passive motion in the shoulder-joint, but very marked crackling on external rotation and very great tenderness over the tuberosities. On elevation of the arm the tender points disappeared under the acromion. A skiagraph showed no bony lesions other than some hypertrophic changes in the acromioclavicular joint, where he had no symptoms. Operation was undertaken as an exploration, in the expectation of finding some peri arthritis with bursal adhesions.

Operation (August 15, 1913). Ether. An incision from the point of the acromion downward for 3 inches was made, splitting the anterior fibers of the deltoid. No evidence of any subdeltoid

bursa was found. Immediately beneath the deltoid the very thin capsule of the shoulder-joint was exposed, and on opening this the head of the humerus was found to be eroded and flattened. The external part of the head was much flattened, and there were two osteophytes at the margin of the articular cartilage (just at the reflection of the capsule on to the anatomical neck), which caught on the capsule during rotation outward and caused a distinct *jump* and crackling. These two osteophytes were removed by gouge. They were about 6 or 7 mm. high. The long head of the biceps, on the inner side of the incision, seemed to be intact.

Pathological Report (Dr. C. Y. White).—Compact bone, denser than normal, covered with cartilage on its free surface. No evidence of inflammation.

The subsequent history is brief and satisfactory. The wound healed promptly, all pain was relieved, and the man returned to his work. He was last seen September 6, 1915, more than two years since operation. He has not had a pain or a twinge in that shoulder since operation, and continues his work without disability, except that he is now developing a Dupuytren's contracture in the palm of the right hand.

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INDICATIONS FOR THE IODOFORM WAX BONE-FILLING OF MOSETIG-MOORHOF¹

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IN 1903 Mosetig-Moorhof² described his method of filling bone cavities with iodoform wax. His formula is: iodoform, 60 parts; spermaceti and oil of sesame, each, 40 parts. These are to be mixed in a sterile pan, on a water bath, being heated slowly up to 80° C., and the temperature of the mixture is then to be kept at 80° C. for fifteen minutes. The fluid mass is then removed from the water bath, and is allowed to cool while being constantly agitated. This long-continued agitation is extremely important in order to secure exact emulsification of the iodoform. Before being put to use, the solidified wax should be warmed up to 60° C., on a water bath, being constantly stirred until thoroughly mixed.

Mosetig-Moorhof laid great stress on proper preparation of the bone cavity, emphasizing the necessity that it be not only sterile but also perfectly dry. The operation, of course, is done under Esmarch anemia. Sterility is sought for, first by cutting away all unhealthy bone. This, as he says, often is a tedious job, and requires rather pedantic use of gouge, rongeur, etc. Then the cavity is irrigated with 1 per cent. formalin, or if there is the least oozing of blood into the cavity, hydrogen peroxide is employed. Next the cavity must be dried. Mosetig-Moorhof himself employed a hot-air blast;

¹ Read before the Philadelphia Academy of Surgery, December 4, 1916. Reprinted from *Annals of Surgery*, 1917, lxxv, 227.

² *Zeit. f. Chir.*, 1903, xxx, 433.

but he said where this was not available cold air could be used if it was properly filtered and dried before being blown against the walls of the cavity. These walls were to be considered dry only when the glistening appearance of moisture was no longer present, as it was necessary for the wax to be applied intimately to the bony tissue, filling every crevice and even blocking the minute bloodvessels which were exposed in the walls of the cavity.

The wax, properly prepared by heating and thorough stirring is now to be poured very slowly into the cavity until the latter is filled absolutely full. Pouring it in slowly he considered of the utmost importance in order to prevent the entrance of any air bubbles. When the mass has solidified the soft parts are sutured without drainage but not so tightly as to prevent the escape of exudations from the soft parts. *Fistulæ* and sinuses which are not included in the operative incision may be left as channels of exit for such necessary drainage.

Mosetig-Moorhof had operated on 120 cases by this method at the time of his original report; so that his method could no longer be considered in the experimental stage. In all these cases, he says, healing eventually occurred without *fistulæ*. In some cases, especially where the soft parts were in bad condition, a little of the wax exuded between the sutures but the bulk of it remained in the cavity, and was slowly replaced by granulations from the surrounding bone.

Until the introduction of this method of treating bone cavities (resulting from operations for bone abscess, chronic osteomyelitis, necrosis, etc.), the only satisfactory way to secure their complete healing was to cut away all of the anterior and most of the lateral walls of such cavities, thus converting the former cavity into a shallow groove down and across which the soft parts could grow. This necessitated a very long time for complete healing of the wound, and in many cases recurrences took place because the surgeon had been too timid in removing overhanging bone at the original operation. Even when healing occurred, the scar resulting

from the slow granulation of the wound was extensive, unsightly, depressed, and often so adherent to the underlying bone that slight injuries caused repeated disability.

Of course the iodoform-wax filling is most easily applied and proves most satisfactory in cases of bone cavities which are sterile or nearly so at the time of operation. Thus in case of bone cysts (Case VI) or early and localized tuberculous disease (Case VII) primary healing usually may be expected; and even in cases of bone abscess with attenuated infection (Cases IX and X) healing usually will occur without further interference, though a sinus may persist for some months. But even in cases not as promising as those just mentioned, *Plombierung* is frequently of inestimable advantage. Thus in Cases V and VIII, though a considerable portion of the wax was discharged during convalescence, the patients were spared the discomforts attendant upon frequent packing of the cavities with gauze; and in neither case was another operation requisite to secure permanent closure of the cavity. In Case V, moreover, a number of previous operations, in none of which was the iodoform wax employed, had been unsuccessful in obtaining cure of the disease. In Case VIII no previous operation had been done. In this connection, I think the course of events in Case I is of interest: Here all the available wax (100 c.c.) was used in filling a cavity on the median side of the femur, and the opening on its lateral surface had to be packed with gauze. The result was that while the former wound healed without further interference, the outer wound required two subsequent sequestrotomies before permanent closure could be obtained.

One of the risks in using gauze in bone cavities is illustrated in Case II: Though the surgeon who last operated upon this patient before she came under my care had filled the cavity with wax, it is evident that either then or at some previous or subsequent time a small fragment of gauze had been lost in the cavity, since I removed such a piece on reopening the unhealed cavity.

Case III was evidently an unsuitable one for treatment by bone-wax. Amputation was clearly indicated, but was persistently refused by the patient and his family; death resulted from sepsis.

In Case IV (excision of the diaphysis of the fibula for osteomyelitis) while the wax probably was not necessary, yet I believe it was useful in stimulating bony growth. At any rate, in a similar case in which no bone-wax was used, the periosteal tube being allowed to fill with blood clot, complete regeneration of the bone did not occur, although a less extent of the fibula was removed (also subperiosteally) than in the case reported herewith.

In a number of cases not recorded here I have endeavored to sterilize the cavity by means of a hot-air blast, as originally recommended by Mosetig-Moorhof. By employing the electric apparatus used for hot-air douches (in the treatment of lumbago, etc.), and conducting the air into the cavity by means of a glass tube, I found the current of air could be delivered at a temperature of 100° C. But I found that this was not sufficient to sear the cavity, and I have been assured by bacteriologists that air could not be sterilized with certainty in so short a space of time as is required for its transit through this apparatus unless it were raised to a temperature of 300° C. Nor have I found radiant heat from the actual cautery more efficient. So of late I have abandoned any such methods, and content myself with chemical sterilization (phenol, iodine, alcohol) and mechanical drying.

The following case histories are selected as exemplifying the main indications for the use of the iodoform wax bone-filling.

CASE I.—Sequestrotomy for necrosis of femur. Alice McG., aged seventeen years, when first seen in 1908 had had several operations for chronic osteomyelitis of the left femur, but several sinuses remained above both the external and the internal condyles, through which bare bone could be felt; and from time to time there were more or less acute exacerbations due to pocketing of pus. She was admitted to Dr. G. G. Davis's service at the Orthopædic Hospital, and operation was done May 14, 1908.

Operation (Dr. Ashhurst). Under Esmarch anemia three sequestra were removed from beneath an involucrum on the median side of the femur; the resulting cavity was filled with the iodoform bone-wax (100 c.c.) and the soft parts were tightly sutured over it. The outer surface of the femur was exposed and curetted, and a button of bone was removed by a trephine, but as the bone appeared healthy here the marrow was not exposed. The outer incision was packed with iodoform gauze, as all the available wax had been consumed in filling the inner cavity.

The temperature rose to 102° F., on the day after operation, but gradually fell to normal. One month after operation the girl went home on crutches, there having been some discharge from both incisions.

July 14, 1908. Two months after operation she walked without a crutch, and the knee could be fully extended. This was impossible before operation. Both sinuses still discharged.

November 3. Scarcely any limp.

September 15, 1910. A sinus on the outer side persists, but there is no disability.

October 25. Inner sinus has again been moist for a few weeks.

June 1, 1911. Outer sinus has never entirely closed since last operation (iodoform gauze packing). The inner sinus has been closed for eight months, with exception noted in October, 1910 (bone-wax used on this side of femur). Today carious bone was curetted above the external condyle; no sequestra were found. The wound was filled with iodoform bone-wax and the soft parts were sutured tightly over it. A sinus formed here later.

November. Dr. Davis curetted and gouged the femur above the external condyle.

February, 1912. Several sequestra were spontaneously discharged from the remaining sinuses.

May. Scarcely any discharge, and only from sinus on outer side of femur.

June 14, 1916. The patient was examined again. The sinuses remained healed since November, 1913. The knee flexes to 100 and extends to 180. There is no disability, in spite of the marked thickening of the femur.

CASE II.—Bone abscess of tibia, removal of scrap of gauze from cavity. Elizabeth M., aged twenty-one years, was first seen in December, 1909, in Dr. Frazier's service at the Episcopal Hospital. It was a case of chronic osteomyelitis of the left tibia, of eight years' duration, for which fifteen distinct operations had been done.

The last operation, in February, 1909, consisted in curettement and gouging of carious bone; the cavity had been filled with iodoform bone-wax, but most of this had been discharged when the skin sutures were removed. Since this operation a small sinus and scab had persisted. For the last two months there had been worse pain, at times very severe. A skiagraph showed an involucrum in the upper third of the tibia, with apparently normal medulla above and below. Though a sequestrum was not visible, it was thought one must be present to account for the pain and persisting sinus.

December 17, 1909. Operation (Dr. Ashhurst). Esmarch anemia. The old cicatrix and sinus were excised, and the periosteum reflected. When the cortex had been cut away, there was found not a sequestrum, but a bit of old gauze (Fig. 38), about $\frac{1}{2}$ inch square, which presumably had become lost in the cavity at a previous operation or dressing. The cavity in the bone was filled with iodoform bone-wax and the soft parts tightly sutured.

January 15, 1910. The wax, which began to discharge when the sutures were removed, is still discharging.

January 20. Went home.

December 4, 1916. Patient reports that five or six subsequent operations have been done on her tibia, but that it has now been firmly healed for three years, though occasionally painful and tender.

CASE III.—Bone abscess of tibia. Andrew B., aged sixty-three years, was admitted to Dr. Frazier's service in the Episcopal Hospital September 9, 1911. Nine years before an abscess over the tibia had been opened by Dr. G. G. Davis under local anesthesia. The incision soon healed and no further trouble had been experienced until about two weeks before his second admission, during which period there had been tenderness, redness and pain over the upper end of the right tibia. On admission the tibia was found thickened, with tenderness and redness and constant pain. The temperature varied from 101° to 103° F., and the leukocyte count was 10,720, with 88 per cent. polynuclears. The man was old for his years, feeble, and evidently seriously ill.

September 11, 1912. Operation (Dr. Ashhurst). Under Esmarch anemia. Pus was found beneath the deep fascia. There was no cloaca on the subcutaneous surface of the tibia. The periosteum, which was thickened and did not strip easily, was reflected and the cortex removed. An abscess containing 10 to 15 c.c. of pus was found in the medulla. (Culture of this

pus gave a growth of diplococcus. Histological examination of the bone showed osteomyelitis, with no evidence of tuberculosis. Dr. C. Y. White.) The entire medulla and cortex throughout the upper third of the tibia (except extremely thin shell of cortex) was riddled with pus, and the bone was easily removed by Volkmann's sharp spoon. The knee-joint was opened at one point through a perforation in articular cartilage of tibia. The entire anterior wall of the cavity was cut away until apparently healthy bone was exposed in all places. No cloaca was found anywhere. The pus which was found beneath the deep fascia must have perforated the cortex through one of Volkmann's canals. The cavity was swabbed with very hot carbolic acid (pure phenol), and then flooded with alcohol, and finally dried with gauze. The cavity was filled with iodoform bone-wax requiring 120 to 150 c.c. The soft parts were closed as securely as possible. It was noted that amputation probably would be required.

The patient did badly, became delirious at night, and six days after operation the knee-joint was found swollen and painful, with much pus discharging from the wound. The patient and his family repeatedly refused amputation, and death occurred September 30, three weeks after operation, from sepsis.

CASE IV.—Excision of diaphysis of fibula for osteomyelitis. Rose H., aged twelve years, was first seen in Dr. Davis's service at the Orthopædic Hospital in May, 1912. In October, 1911, the girl had fallen over a rope and hurt her right leg. It swelled up, and in November, 1911, two incisions were made by the family physician, under a general anesthetic, and the wounds were packed with gauze for a long time subsequently. When seen at the Orthopædic Hospital the whole outer side of the right calf was bluish, the skin thickened and hard; two sinuses were discharging pus; one, above the middle of the fibula, the other just above the external malleolus. A skiagraph showed the fibula thickened to the size of the tibia, and at the upper sinus a sequestrum projecting from the cortex. There was no evidence of recently formed subperiosteal bone, nor of a marrow cavity, nor of an internal (tubular) sequestrum.

May 10, 1912. Operation (Dr. Ashhurst). Under Esmarch anemia the entire diaphysis of the fibula was removed by twisting out each end, after sawing through its center. Numerous small areas of subperiosteal bone were left attached to the periosteal tube. After suturing the periosteum, deep fascia and skin, except over the center of the incision, the periosteal tube was



FIG. 38.—Case II. Fragment of gauze (from previous operation) removed December 19, 1909, by sequestrotomy.

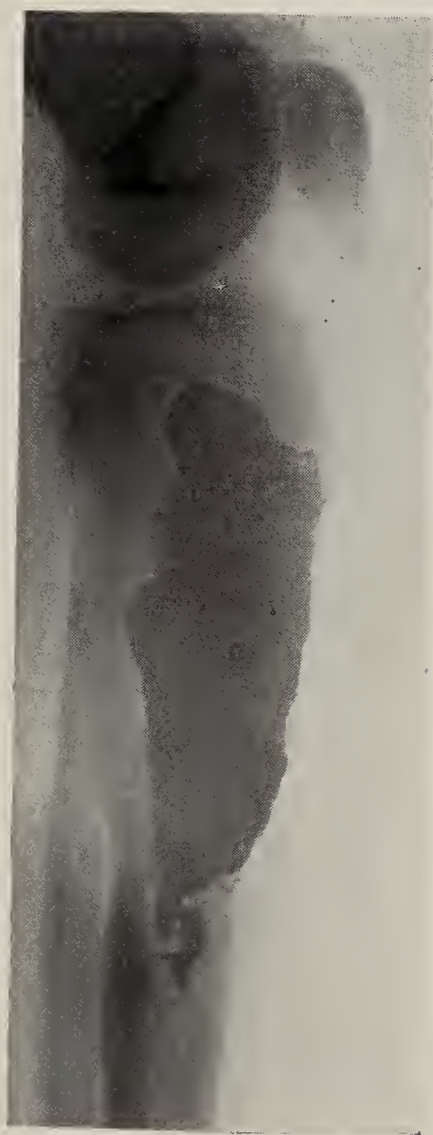


FIG. 39.—Case V. Iodoform bone wax in cavity of tibia, one week after operation.



FIG. 40.—Case VI. Bone cyst of tibia.



FIG. 41.—Case V. Bone cyst of tibia.



FIG. 42.—Case VI. Cavity in tibia filled with wax, a few days after operation.

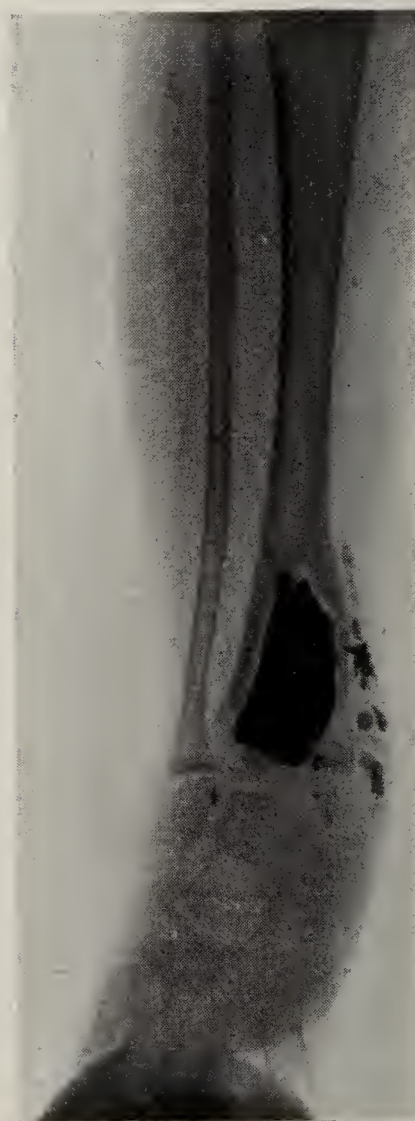


FIG. 43.—Case VI. Eleven weeks after operation, showing partial absorption of bone wax filling.



FIG. 44

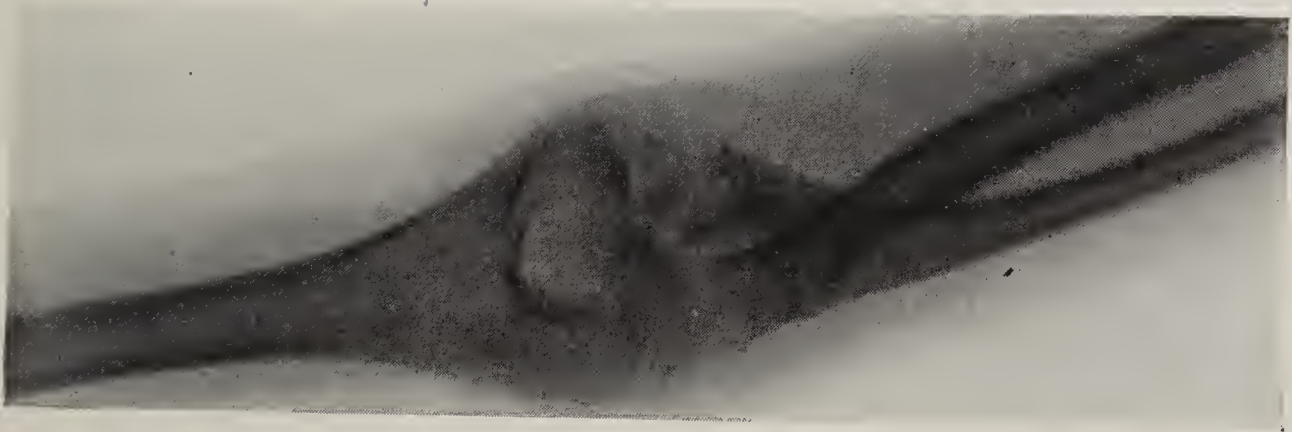


FIG. 45

FIGS. 44 and 45.—Case VII. Tuberculous cyst of ulna, two years after injury.

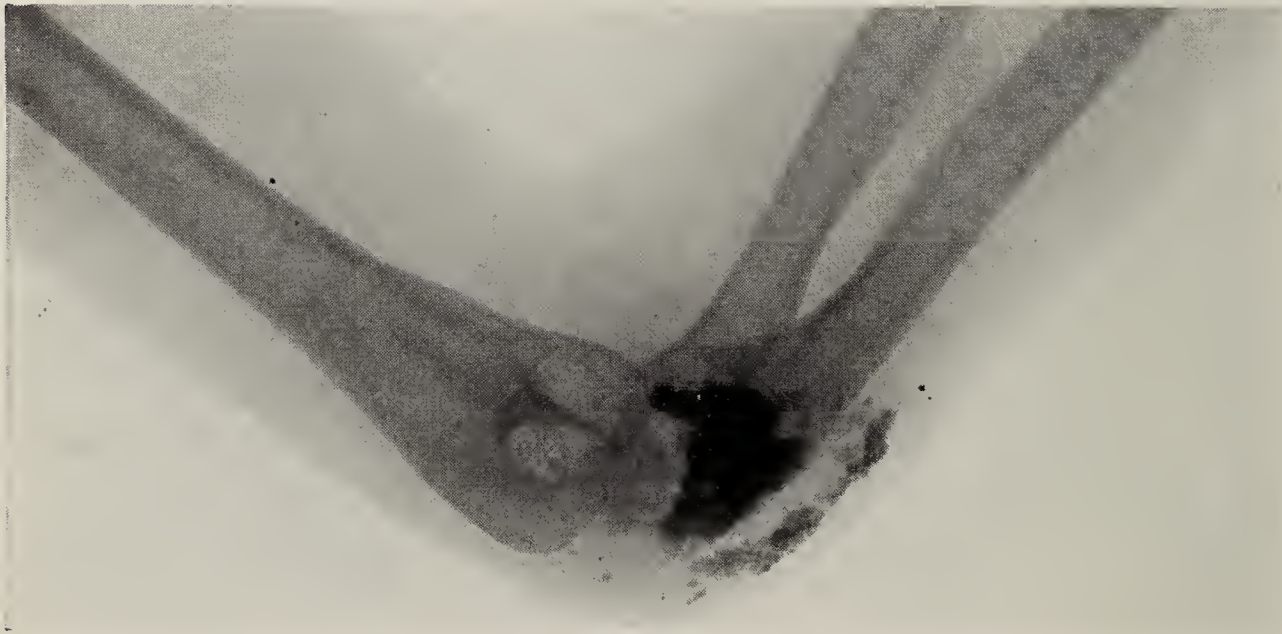


FIG. 46.—Case VII. Iodoform bone wax in cavity of ulna, a few days after operation.

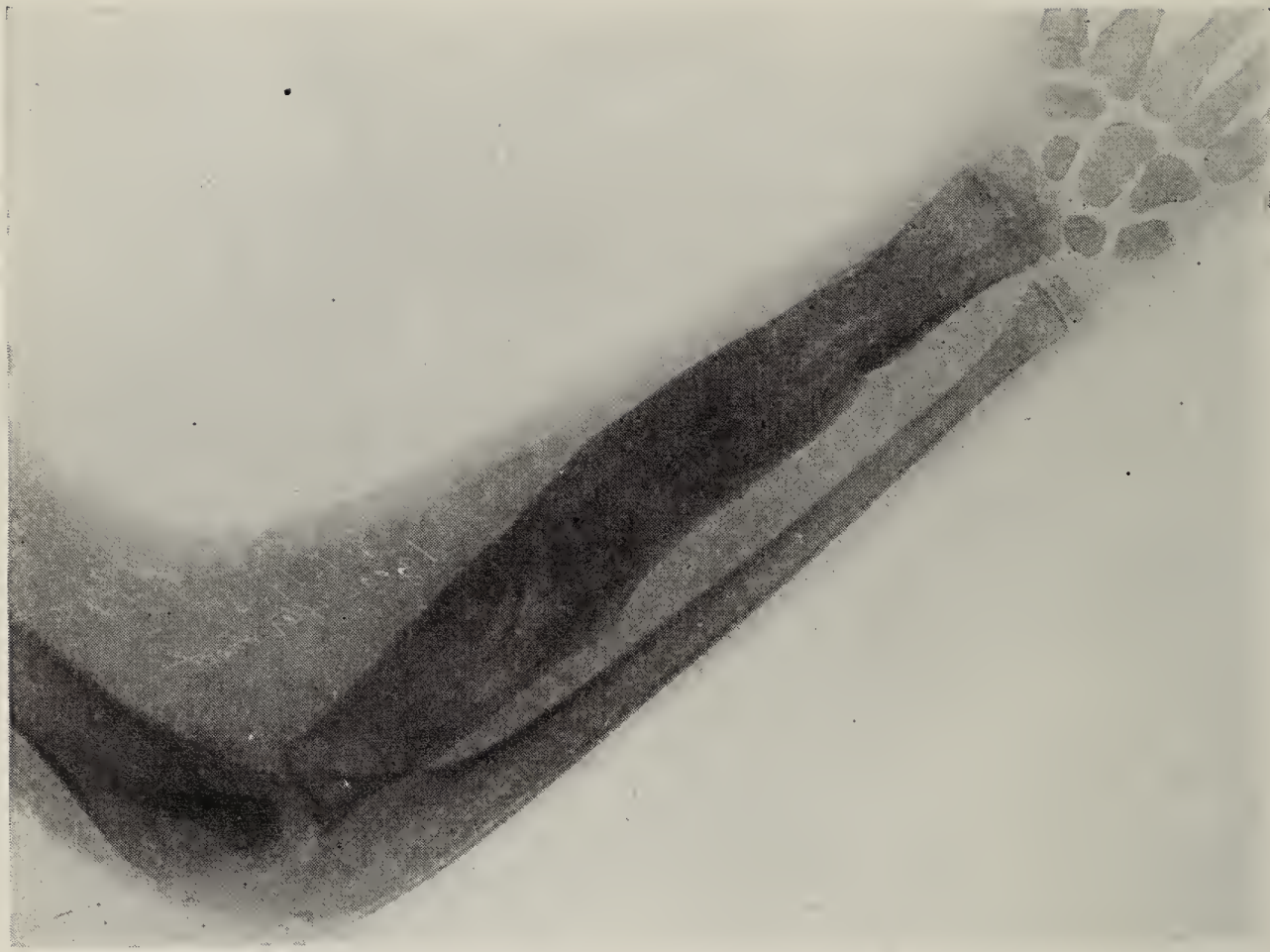


FIG. 47.—Case VIII. Necrosis of radius, one year after onset. Cor-tical sequestrum in shaft of radius surrounded by involucrum; also epiphysis of head of radius detached as sequestrum.

injected with iodoform wax. The center of the incision was then closed tightly, the wound dressed, and the Esmarch band removed. A plaster-of-Paris dressing was then applied from toes to upper thigh.

May 12. Temperature 102° F. No symptoms. X-ray shows wax only in central portions of periosteal tube.

May 15. Temperature normal since May 12. First dressing through window in gypsum case. Moderate purulent discharge from two ends of incision.

July 23. Has been walking without support for three weeks. Incision firmly healed for one week. Skiagraph shows nearly complete regeneration of fibula.

March 11, 1913. Skiagraph shows complete regeneration of fibula, ten months after operation.

March 23, 1914. Presented at a clinical meeting of the Philadelphia Academy of Surgery, held at the Episcopal Hospital.

CASE V.—Recurrent osteomyelitis of tibia. Philip R., aged sixteen years, was seen in Dr. Frazier's service at the Episcopal Hospital, in December, 1912. In April, 1912, the right knee became painful and tender following a slight injury, and after being at home a few days in bed he was admitted to Dr. Mutschler's service in the Episcopal Hospital, April 9. Two days later Dr. Mutschler made an incision through the periosteum of the tibia, finding subperiosteal pus. The cortex was not incised. The boy did not do well, and on June 28 Dr. Mutschler operated again, finding new-formed subperiosteal bone; this time the medulla was opened and drained. In October, 1912, and again in November, 1912, Dr. Frazier removed some necrotic bone.

December 10, 1912. For the last few days there has been tenderness, redness and pain around the head of the tibia, this being a part of the bone not explored at any of the former operations. There are now gutters in the upper and lower thirds of the leg, with an area nearly healed in at the mid-third. The foot is in slight permanent equinus. The boy is thin, pale and anemic.

December 11. Operation (Dr. Ashhurst). Esmarch anemia. The cicatrix in the upper third of the tibia was excised, and the head of the bone was exposed. Little periosteum was left; the cortex was gray, spongy and soft, and infiltrated with pus. There was an abscess in the medulla extending up to the epiphysal cartilage. The cavity was swabbed with pure carbolic acid, flooded with alcohol, dried, and filled with iodoform bone-wax

(50 to 75 c.c.) (Fig. 39). By undermining the skin this could be sutured tightly over the wax. The leg was dressed on an inclined plane in a fracture box.

December 15. There has been no rise in temperature nor any unfavorable symptom since operation. Subsequently, when the sutures were removed, some of the wax discharged through the opening.

March, 1913. There remains an opening 3 inches long and 1 inch deep at the upper end of the tibia; this is covered with healthy granulations.

June. Granulating area at upper end of tibia 2 cm. deep.

September. Upper area of granulations only 5 cm. long, and shallow. In lower part of leg only a superficial ulcer remains. Gradual healing after this date.

November 22, 1915. Reports now because of painful swelling over *left* tibia. The right leg is not yet completely healed, as the scar is thin and adherent to the bone, and easily breaks down.

November 23. The swelling over the left tibia was exposed under Esmarch anemia; the periosteum was thickened and was partly responsible for the spindle-shaped swelling. The cortex, which was removed by gouge, was very thick and sclerosed. The medulla when exposed was apparently normal. The overlying cortex was removed for a distance of about 10 cm. (a culture from the medulla remained sterile; the bone specimens were lost in the laboratory). The cavity was filled with iodoform bone-wax, and the soft parts were sutured tightly. Then the adherent cicatrix was excised from the right tibia, and the skin closed without tension by undermining its edges.

December 9. The boy was allowed to go home. There had been a slight oozing of wax from the incision in the left leg. The right leg was healing well.

November, 1916. The boy was seen on the street several months after leaving the hospital, and appeared to have no disability. As he has not returned for further dressings, it is presumed the incisions have given no further trouble.

CASE VI.—Bone cyst of tibia. Columbia G., aged five years, for two or three years had had swelling above the left ankle. For the last four or five months there had been pain and a limp. She was admitted to Dr. Frazier's service in the Episcopal Hospital. Skiagraphs showed a cyst in the lower end of the tibia (Figs. 40 and 41).

August 27, 1913. Operation (Dr. Ashhurst). Under Esmarch anemia a curved incision was made over the subcutaneous surface of the lower end of the tibia. The periosteum was a little thickened, and the cortex slightly hyperemic. The cortex was about 2 mm. thick, and on removing this a yellowish-white cyst wall bulged into the opening. On cutting through this with scissors, some semifluid matter, which resembled tuberculous pus, oozed out, and then considerable cheesy matter, but no fluid. There was a good deal of carious spongy red bone surrounding the cavity, and it was thought to be a tuberculous abscess of bone. On the posterior wall of the cavity the cyst had perforated the cortex over an area about 3 mm. in diameter. The cyst cavity was the size of a pigeon's egg, and extended down to the epiphyseal cartilage. The cavity was scraped clean, and filled with bone-wax (Fig. 42). The soft parts were closed without drainage, and a plaster-of-Paris dressing was applied.

September 3. Gypsum dressing removed on account of pain in the leg. A little of the wax was found discharging between two sutures. A new gypsum case was applied, with a window over the wound.

October 3. No discharge from the wound since last note. Wound now healed.

November 28. Sent home, walking, in light brace. A skiagraph (Fig. 43) showed considerable concentric growth of bone around the iodoform wax filling, which has been slightly absorbed.

February 12, 1914. Six months after operation. The leg seems normal. The foot does not dorsiflex beyond 90°. She continues to wear the brace. Circumference of right calf, 21.5 cm.; of left calf, 18.5 cm.

Pathological Report (Dr. C. Y. White). Culture and smear from cyst negative. Unfortunately the cyst wall and contents were mislaid in the operating room, and did not reach the laboratory in fit condition for histological study or for inoculation into guinea-pigs.

November, 1916. A report from this patient was secured through the Social Service Department of the Orthopædic Hospital. There is no apparent disability, and the wound continues closed.

CASE VII.—Tuberculous cyst of ulna. James C., when about six years old, fell and hurt his left elbow. He seems to have suffered no particular disability as a result, but two years later (July, 1914) applied to the Orthopædic Dispensary of the Episcopal

Hospital for limitation of motion. There was decided limitation of rotation in the forearm, and the elbow flexed only to 50 and extended to 130 degrees. There was no pain, no heat, and only slight thickening of the elbow region. A skiagraph showed a cystic condition of the upper end of the ulna, apparently extending to the joint surface (Figs. 44 and 45). It was thought to be a "benign bone cyst" and after keeping the child under observation for four months, and finding no change in the local condition, operation was advised and accepted by the parents.

November 4, 1914. Operation (Dr. Ashhurst). Under Esmarch anemia an incision was made over the subcutaneous surface of the ulna below the olecranon. The periosteum was incised and reflected. The cortex appeared unduly inflammatory, with a large number of bleeding points (much as the tibia in Case VI); the cortex was soft and easily removed by a gouge, without the use of a hammer. The cortex was 0.5 cm. thick, and when it was removed a smooth fibrous layer was exposed, which constituted the cyst wall. Enough of the overlying cortex was removed to expose the cyst wall fairly well, over an area approximately 2 by 4.5 cm. An attempt was then made to enucleate the cyst without rupture, but this proved impossible, since at the coronoid process of the ulna, and over the entire articular surface the cyst wall was densely adherent to the bone, dipping down into irregular notches and depressions. Those portions of the cyst wall which were not removed along with the cyst contents were scraped off the adjacent bone with the sharp spoon. The contents of the cyst resembled granulation tissue; no fluid was present. The cavity in the ulna was filled with iodoform bone-wax (Fig. 46), and the periosteum and then the skin tightly sutured. The Esmarch band was not removed until after the dressings had been applied. (The pathological study of the specimen (Dr. C. Y. White) showed tuberculous osteomyelitis; injection of the tissue into a guinea-pig was positive for tuberculosis.) This report is of interest, especially as the x-ray picture did not suggest a tuberculous process. The skiagraph is practically identical with that of the second case reported as chronic fibrocystic osteomyelitis by Barrie.¹

November 23. There has been a little discharge of wax since operation.

December 7. Wound is firmly healed.

December 18. Plaster-of-Paris case applied, the laboratory report of the tuberculous nature of the lesion having been received.

¹ Surgery, Gynecology and Obstetrics, 1914, xix, 42, Fig. 2.

March, 1915. Gypsum case removed, and arm carried in a sling.

May. As heat in elbow persists, an internal angular splint was applied, in addition to the sling.

June. No heat or swelling. Splint removed.

July. Sling discontinued.

October. Motion 50 to 120 degrees. Never any pain.

August, 1916. Motion 70 to 140 degrees. No symptoms.

November. Motion 45 to 115 degrees. Plays ball and has no disability. If motion does not improve when epiphyseal growth is complete, excision of the elbow may be advisable. A skiagraph shows no vestige of wax remaining; the upper end of the ulna is rarefied, but much of the cortex has reformed, apparently of normal density.

CASE VIII.—Necrosis of radius. Joseph P., aged nine years, in September, 1911, came to the Orthopædic Hospital with running sores in his left forearm. The trouble began acutely about one year previously, with pain, swelling, and disability in the left forearm, the height of the attack being reached within one day of its onset. He was in a hospital for seventeen days, but no operation was done. Two months later sinuses formed, and later still his family physician made an incision over the head of the radius. This is the only opening that was healed. Three sinuses are still open; one above the internal condyle of the left humerus, one below the flexure of the elbow, and one above the styloid process of the radius. The discharge is profuse and very foul; and the radius is thickened. Supination is lost, and there is only 30 degrees of motion in the elbow. A skiagraph shows a long sequestrum present beneath an involucrum of the radius, in which two cloacæ are visible. The epiphysis of the head of the radius is displaced in front of the elbow-joint, but the remainder of the radius is not dislocated (Fig. 47).

September 11, 1915. Operation (Dr. Ashhurst). Esmarch anemia. Incision upward from radial styloid, excising the lowest sinus. The superficial radial nerve was identified, and followed up to the interval between the brachioradialis and the extensor carpi radialis longior, thus baring the shaft of the radius to above the attachment of the pronator teres. The involucrum was 2 cm. thick, and the two cloacæ seen in the skiagraph corresponded to the two sinuses in the soft parts. Through these the long sequestrum was visible. The involucrum was cut away from one cloaca

to the other, a distance of 12 cm., and the sequestrum was removed (Fig. 48). It was a cortical sequestrum, evidently part of the original cortex, the involucrum being formed by new subperiosteal bone. Exploration of the sinus above the internal condyle showed that it led to the region of the head of the radius. A second incision was made, therefore, over the head of the radius, and the radius bared, and a tunnel made directly through its head, in the search for another sequestrum. None was found, but on introducing a curette into the sinus above the internal condyle a moderate amount of pus was evacuated, and the epiphysis of the radial head was found lying loose in the sinus as a sequestrum (Fig. 48). The bone cavities were dried by radiations from the Paquelin cautery, filled with iodoform bone-wax, and the soft parts tightly sutured, except the old sinus above the internal condyle.

September 18. The incisions have broken open, but there has not been much discharge of pus or wax (Fig. 49).

September 27. Most of the wax seems to have been discharged, and the incisions are closing in.

February, 1916. The boy has been at a convalescent home since the autumn. The incisions are all healed; only a scab remains over the head of the radius, and in the center of the long incision over the lower radius. There is motion in the elbow from 80 to 120; the forearm is in almost complete pronation, and little rotation is possible. An abscess in the axilla has recently formed and has been opened, leaving a mass of lymph nodes, which were excised in March, 1916.

November, 1916. All sinuses remain closed. Range of motion a little greater.

CASE IX.—Bone abscess of tibia (Markoe's abscess).¹ Harriet C., aged thirty-nine years, had had disease of her right tibia ever since she was fifteen years of age. For twenty-four years a sinus had persisted over the upper end of the crest of the tibia, where the bone was thickened (Figs. 50 and 51). She was admitted to the Episcopal Hospital.

November 9, 1915. Operation (Dr. Ashhurst). Esmarch anemia. The sinus in the soft parts was excised, and the bone overlying the abscess cavity was removed by gouging. The cavity contained reddish brown granulation tissue. Pathological

¹ "Markoe's abscess," described by Thomas M. Markoe, of New York, in his *Treatise on Diseases of the Bones* (1872) as "chronic sinuous abscess of bone."

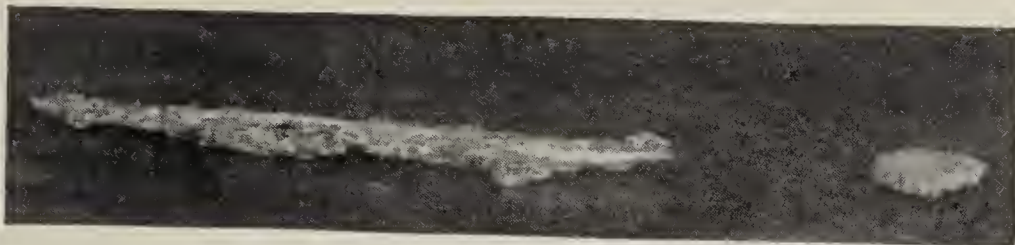


FIG. 48.—Case VIII. Sequestra from radius. Small one is epiphysial centre of head of radius. Large one is cortical sequestrum from shaft (embedded in new subperiosteal bone).



FIG. 49.—Case VIII. One week after sequestrotomy and *Plombierung*.



FIG. 50. — CASE IX. Chronic sinuous abscess of tibia for twenty-four years (Markoe's abscess).



FIG. 51.—Case IX. Markoe's abscess of tibia (chronic sinucus abscess), discharging for twenty-four years.



FIG. 52.—Case X. Bone abscess, eleven days after operation.

examination of this tissue gave a "mixed growth" and there was no histological evidence of tuberculosis (Dr. C. Y. White). No normal medullary cavity was exposed, the bone surrounding the abscess cavity on all sides being inflammatory, and resembling in appearance that seen in cases of staphylococcic inflammation. The cavity was filled with bone wax, and the soft parts tightly sutured over the bone. The Esmarch was removed after the limb had been dressed.

November 24. Upper portion of incision has healed solidly, but some wax exudes below.

December 8. Went home, using crutches. A small sinus remains, which is barely moist.

November 8, 1916. Reports for examination one year after operation. The incision has been firmly healed since June (five months). There is no disability.

CASE X.--Bone abscess of tibia (Markoe's abscess). Eugene S., aged thirteen years, cut his left leg by a knife, in May, 1915, injuring the bone below the knee. He came to the Episcopal Hospital in December, 1915. In July he had begun to complain of pain in this region, and after three weeks of increasing disability an abscess had been lanced, in August, 1915. Since then a sinus had been present over the head of the tibia, at times scabbed, but usually weeping a little thin pus. Small pieces of bone had been discharged occasionally. A skiagraph showed a cavity in the upper end of the tibia.

December 8, 1915. Operation (Dr. Ashhurst). Esmarch anemia. A flap of skin was turned up from the head of the tibia with its base on the fibular side. The sinus led into the tibia just below its tubercle on the median side of the bone. The overlying bone was removed by gouge, and the abscess cavity exposed. This was found to extend through the cortex posteriorly over a small area, where the abscess cavity was limited by periosteum. The tibial crest was not removed, but by gouging away the lateral as well as median surfaces of the tibia, the abscess cavity was fairly well exposed. The surrounding bone, infiltrated with puriform matter, was scraped away by Volkmann's spoon until healthy hard bone was reached on all sides, and until healthy red marrow was exposed below. The cavity was then filled with 3 per cent. iodine solution, and when this was wiped out it was replaced with iodoform bone-wax, about 30 c.c. being required. The periosteum and skin were closed separately over the wax, as

securely as possible. After dressing the wound the Esmarch was removed.

The pathological report on the tissues (Dr. C. Y. White): chronic granulation tissue; guinea-pig injected remained negative for tuberculosis; smear from pus showed a large diplococcus.

December 19. A skiagraph shows the wax filling the cavity (Fig. 52).

January 22, 1916. Went home, incision almost dry.

February 21. A skiagraph shows the wax all gone; most of it has been absorbed, as no recognizable quantities have been discharged.

November 8. A small sinus remained until last June. Since then it has been open only one day. The incision is now firmly healed.



FIG. 53.—Flat-headed femur in a lad aged eighteen years.

A CASE OF FLAT-HEADED FEMUR (PERTHES'S DISEASE)¹

BY ASTLEY P. C. ASHHURST, M.D.
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DR. ASHHURST presented an *x*-ray picture (Fig. 53) of a patient, now eighteen years of age, showing a flat head of the femur. This young man says that when five years of age he had a multiple arthritis, which laid him up for about a year. When he got about he was lame in the right hip, and has been lame ever since, but has never been laid up. There is shortening of 1.5 cm., and the thigh is 5 cm. less in circumference than the left. Flexion of the hip is slightly limited, internal rotation is lost, and there is almost complete loss of abduction. The question is, is every case of flat-headed femur an example of so-called Perthes's disease?

Perthes was not the first to describe the condition. One of the studies of this affection which caught Dr. Ashhurst's attention first was by Calvé, in the *Revue de Chirurgie* for 1910; he called it a "particular form of pseudocoxalgia." A case of coxa vara seen at the Episcopal Hospital in 1913 was thought to be an example of this affection.²

It must be remembered that for very many years all forms of hip disease were undifferentiated. Then the tuberculous nature of many of them became recognized, and for a time many surgeons considered all cases of hip disease tuberculous. It is only within a comparatively few years that it has been possible to disprove the tuberculous nature of some cases, and among these non-tuberculous cases we must place instances of Calvé's or Perthes's disease (osteochondritis deformans juvenilis), but of their true pathogenesis we are still in doubt.

¹ Read before the Philadelphia Academy of Surgery, December 6, 1915. Reprinted from *Annals of Surgery*, 1916, lxiii, 374.

² Klauder: *Medical and Surgical Reports of the Episcopal Hospital*, 1914, ii, 269.

THE TREATMENT OF INFANTILE PARALYSIS DURING THE PERIOD OF RECOVERY

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THE course of infantile paralysis is divided into three stages: the acute illness, the recovery, and the final condition of permanent paralysis.

The acute stage lasts until all the inflammatory conditions of the disease have fully subsided. Of its conclusion the best evidence is the disappearance of restlessness, pain, soreness or tenderness of the muscles, nerves, and joint structures. Free handling of the child and active and passive motions of the trunk and extremities will now elicit no evidence of pain or discomfort. The time occupied by the acute stage varies in length from a few days in the slight cases to three or four months in the severe ones.

Now comes the stage of recovery, or convalescence. Various muscles or groups begin to show return of power which increases fairly rapidly for three or four months and then, usually, more slowly. The rapidity and the degree of recovery vary widely in different types of cases and depend much upon the care and treatment of the child during this stage. It may continue for a year or even much longer. One cannot say in any individual case how long the increase in power will continue or how far it will go, although after several months he may safely give a broad prognosis as to the extent of the child's permanent disability. For example, if both lower extremities remain without power at the end of three months, there can be no doubt that the child will be seriously

crippled for life. But if there be power in the gluteal muscles even though there be none below the hip, one may be fairly sure that eventually the child will be able to walk even without apparatus, if it has the necessary orthopedic treatment. The point to be repeated and emphasized is that during the stage of recovery proper care and treatment will secure more rapid and complete cure, while neglect or injudicious treatment will delay the return of power and seriously increase the handicap under which the cripple must labor during the rest of his life.

Finally comes the stage of permanent paralysis. No longer, if the child has thus far received proper care and treatment, may we expect any increase in the power of partially paralyzed muscles, or any return of activity to muscles that are fully dead. This does not exclude the normal group that may occur in a muscle that is partially paralyzed, but should be taken to mean that the ratio of the strength of a paralyzed muscle to the strength of a similar normal muscle will no longer increase. Nor does it mean that the cripple will not learn during this stage of permanent paralysis to secure better control and to make better use of his weak members. He will acquire a better art of balance and the substitution of a muscle or group of muscles to take the function in part of the weak or totally paralyzed muscle; he will learn unconsciously to vary the play of muscles and their antagonists. Indeed he may learn to walk quite well, to mount and descend stairs without the use of apparatus or artificial support of any kind even though he has not even a flicker of muscle power below the hip-joints. To these ends, too, he may be tremendously assisted by various orthopedic operations.

The treatment of the patient during the acute stage of poliomyelitis I will not here discuss as it falls rather within the realm of the general practitioner than that of the orthopedic surgeon.

But with the subsidence of the symptoms of acute inflam-

mation mentioned above begins an exceedingly important period that will eventually determine how serious a cripple the patient will be. And the methods of treatment employed are of vital importance in determining how great or how small shall be the physical disability that is the cripple's barrier to a useful and a happy life.

At the end of the inflammatory stage the spinal centers involved are left in a more or less weakened condition. All the motor cells that control a muscle or a group of muscles may be dead. In such case no power can ever return. Again, only a part of the center, many or few of the cells, may be involved, and the muscles innervated from this center will be severely or but slightly weakened. In a third case, none or but very few of the motor cells have been strangled to death by the inflammatory exudate, but they are in an anemic and exhausted condition. Here the muscles may appear to be completely paralyzed or greatly weakened; but there is the possibility of almost complete restoration to normal power. Just what the pathological condition is in any particular case after the acute illness has run its course, no one can say; but the point is that there are probably many motor cells in the spinal centers which are only more or less exhausted and which are capable of resuming their function under favorable conditions. One phase of the treatment must be based on this supposition.

Another part of the treatment is directed toward the muscles which are, in whole or part, paralyzed. If we could see these muscles we would find them also anemic, flabby, soft, easily injured by rough handling, easily stretched and with little or no power of contracting. They may show complete reaction of degeneration. If active innervation does not sooner or later return to them they will gradually waste away until scarcely anything remains of them but fibrous bands.

A similar condition of anemia and lack of tone exists in the ligaments and capsules of the joints of the involved members, which must not be forgotten in the treatment of the case.

In the neuritic forms of infantile paralysis there exists a pathological condition of the nerves, but this usually demands no separate treatment after the first stage of the disease has passed. The measures employed to aid the muscles and the spinal centers will also benefit the nerves that connect them.

Finally, the bones of the members involved in the disease must receive consideration. In a paralyzed extremity the bone suffers as well as the muscles. It fails to develop properly. The limb becomes to a more or less degree shorter than the fellow normal limb. I have seen a shortening of 5 inches in a lower extremity due to infantile paralysis. This is caused by lack of normal function of the bones which consists of weight bearing and resistance to muscular tension. Lack of function means anemia and retardation of growth.

Therefore, we may say that the treatment of infantile paralysis during the period of convalescence, or recovery, aims first to secure as rapid and complete as possible restoration of the spinal cells, the nerves, the muscles, the ligaments, and the bones to their normal condition and function, and, second, to prevent distortions or deformity of any of the parts involved. The first object is accomplished primarily by rest during which nature herself restores the exhausted nerve centers and the weakened muscles; and secondarily, by careful stimulation and by gradual and cautious resumption of active function. All bodily structures develop by an alternation of activity and rest. The same holds true during the convalescence from infantile paralysis; but the nice question is to proportion the periods of activity and rest properly, so that the weaker structures may not be exhausted by too great stimulation and too little rest, or recovery be delayed by inactivity. Too much treatment is probably more harmful than too little. The second object, prevention of deformity, is secured by maintaining the paralyzed members in proper positions to prevent contractures or overstretching of muscles and ligaments, and capsules of joints, and to prevent

changes in the normal contour of the bones and their articular surfaces.

Having considered the principles which are to guide us in our treatment let us now consider the subject in its concrete form and practical application.

During the acute stage of the disease the child has been kept at rest as nearly absolute as possible under the conditions present. During the beginning of the second stage this rest should be continued for a length of time which varies in different cases. If the paralysis is slight, if the child is strong and in good general condition, it will be undesirable and impossible to keep him at rest very long. If the illness has been severe and the child has been left exhausted, emaciated, and suffering from gastro-intestinal disturbances, as many of them are, or left with extensive paralysis, the period of rest must be continued for weeks or months after all signs and symptoms of the acute stage have vanished. Nature is exhausted and requires a long sleep. Each case is a law unto itself.

After the pain and tenderness have disappeared, hot baths should be followed by careful and skilful massage. Such massage consists at first only of gentle upward stroking to aid the circulation. Kneading movements and other vigorous procedures must be absolutely avoided as they will bruise and destroy the delicate paralyzed muscles. After the muscles have begun to regain power and tone then these manipulations may be employed gently and be gradually increased.

Hot baths may be followed by cold douches after the child has regained sufficient strength. A weak child would not react sufficiently after a cold bath or douche to justify its use.

Now comes the time when stimulation to activity should be begun. The period of absolute and continued rest is past. In ordinary cases this is two or three weeks after the end of the first stage. The best artificial stimulant to activity at our command is the electric current. It stimulates the circula-

tion, dilating the vessels and bringing blood to the part, it produces active contractions of the muscles, it sends electric currents along the nerves from the muscles to the spinal centers and stirs the nerve cells of the cord to activity. Its employment is extremely important, but it must be properly given.

The interrupted galvanic current is the best of electricity to be employed. The positive pole should be placed over the muscles and the negative over spine, or at times over the upper pole of the muscle. The anodal opening current (A. O. C.) will probably produce the greatest contraction in degenerated muscles. But experiment should be made in each case to learn how the electricity is best applied to produce the greatest contraction with the least strength of current. The current should be interrupted twenty to sixty or seventy times a minute, should not be of greater strength than 10 ma., and should not be applied for more than a minute or two to any group of muscles at the beginning and the time gradually lengthened to not more than five minutes. When you finally produce a contraction in the paralyzed muscles, repeat the contraction once or twice and then remove the electrode and encourage the child to produce a voluntary contraction of the same muscles. Massage and electricity should be continued as long as improvement continues, *i. e.*, during the second stage of the disease, but I believe they are practically useless in the third or final stage of paralysis. Certain newer methods for the application of electricity and radiant energy seem to hold great promise.

The greatest natural stimulation to regeneration, repair, and growth of the bodily structures is the functioning of the structures.

Therefore, active contractions of the muscles and their use in normal functions is nature's best method of restoring their power. I firmly believe that the patient should be patiently and persistently taught and encouraged to begin active exercises just as soon as the period of absolute rest has passed.

By all manner of persuasion the child should be induced to use the weakened muscles. If it is too young to comprehend what is desired, resort to indirect methods. Tickle or prick the foot on the sole to make the child draw the foot or leg up, on the side to make it move the foot in the opposite direction, on the dorsum to make it move the foot downward. Prick the thigh to secure adduction, abduction, flexion, or extension. Scratch the top of the child's head or hold above it a toy or food to induce it to elevate the arm or to grasp with the hand any offered object. While in a warm tub the patient may make movements that are impossible in the bed. The physician cannot take the time each day to do all this, but he should impress upon the mother or nurse the vital importance of it. It may require the utmost patience and skill in handling the child. If he is old enough to understand and to coöperate with you the task is much easier. Have him try to move the crippled member even though he is unable to do so. Encourage and assist him by passive motion of the limb while he is making the mental effort to move it.

If but a muscle or group of muscles be paralyzed and the antagonists be strong then exercise the weakened muscles but refrain from overdevelopment of the antagonists. However, this principle must not be carried to an extreme. Some writers tell you to have the child in this condition refrain from such normal activities of life as walking and playing. With this I do not agree. I believe function with alternating periods of rest to be nature's chief restorative. If the anterior leg muscles of the child be weakened and the calf muscles be normal, shall we never allow the child to walk until the anterior muscles have returned to normal strength? Then often must we keep the cripple in bed or in a chair for the remainder of his life. Not so. Apply a light brace that will by a stop-joint at the ankle prevent dropping of the foot below a right angle. Thus will the anterior muscles be free from overstretching and be able to exercise their function of elevating the foot. Let the child walk as soon as walking will not produce deformity.

The normal development of the bone of the extremity likewise depends upon the exercise of function. If the bones be not subject to muscle pull and to bearing of weight and withstanding of tension, they will not grow as they should. Therefore, here we have another very urgent reason for weight bearing and normal activity as soon as this can be secured without the risk of too great deformity. I would rather, indeed, take the risk of a slight deformity which is readily corrected afterward than too long deprive the member of its natural use.

Five inches of shortening in a leg is in truth a greater handicap than any distortion of the foot that would be caused by weight bearing. And we have in various braces and apparatus the means at our command to prevent serious deformity while we allow function. Braces also enable the patient to secure locomotion when it would be otherwise impossible.

This brings us to a consideration of the second objective of treatment, namely, the prevention of distortion, or deformity.

This should be borne in mind practically from the very beginning of the illness, for it is amazing how soon it may arise in many cases.

When the muscles of the spine are paralyzed the child should be kept on his back in a firm, hard bed (a fracture bed) for a long period of time until these muscles that support the trunk have had opportunity to recover in whole or in such part as is possible. Among the severest and most helpless deformities that one can see is bad paralytic scoliosis. And when the child is allowed to sit or walk his back should be protected by a removable plaster or celluloid jacket or by a brace. This appliance should be removed to permit of exercise of the weakened muscles but not of the strong antagonists, if there are any. The erect posture should be assumed for short periods of time at first, and its effects closely watched. Paralysis of the abdominal muscles must be cared for in similar manner.

In paralysis of the upper extremities the problem is also a very difficult one. The child must be kept on his back in bed. An upright position will allow the humerus to drop away from beneath the acromion and overstretch the muscles and the other soft parts about the shoulder-joint. When finally the patient is allowed to sit or to stand erect the arm should be supported in a sling. Other means must be taken while the patient is in bed and afterward to prevent any tendency to overstretching of muscles and ligaments and contracture of the antagonists.

When the lower extremities are paralyzed they should be kept fixed with the feet at a right angle to the leg, the knee and the hip extended, and with the patella pointing directly upward. This position prevents foot drop or pes calcaneus, contractures at the hip or knee, and internal or external rotation of the thigh, together with the capsular and articular changes which accompany these deformities. The bed clothes should not be allowed to press upon the toes. Not only is deformity thus prevented but also overstretching of muscles which is a serious obstacle to their recovery of power.

We have seen instances of recovery of power in the anterior leg muscles secured after the paralysis by a tenotomy of a contracted tendo-Achillis and fixation of the foot and leg in plaster in a corrected position. We have seen crippling deformity of the structures of the hip-joint with one leg in internal rotation and the other in external rotation which arose because the child was allowed to lie on one side, and typical frog-leg deformity because it lay on its back with external rotation of the thighs, flexion of the knees and extension of the ankles. Many children are crawling around on all fours instead of standing erect because they have contracture deformities at the hips and the knees which involve not only the tendons and fasciæ but also the capsules of the joints and the articular surfaces of the bones.

Usually a light wooden right-angled splint for the foot with a short transverse piece at the back of the heel is sufficient to

maintain the entire lower extremity in the correct position. Or a similar splint may be made of plaster of Paris. This is probably better in those cases that present a strong tendency to contracture of the tendo-Achillis. The heel must be kept firmly bandaged down in the angle of the splint. The splint is removed for the application of massage and electricity and for active exercise.

The child should be allowed to walk sooner or later depending on the extent of the paralysis. Many slight cases of paralysis have shown no symptoms of acute illness and are diagnosed only through a slight limp. They have never ceased to walk. Others slightly more severe may be allowed to walk within a few weeks after the onset of the paralysis. All that these may require to prevent deformity is a well-fitting shoe with the heel kept well in place by an instep strap and with the inner or outer side of the sole and heel raised slightly if there is a tendency to lateral deformity of the foot. Again, a brace may be required to below the knee or to below the hip, or even with a band about the pelvis to support part of the weight of the body and prevent deformity at any of the joints of the lower extremity. The child may require braces on both lower extremities and the use of crutches in order to stand and walk. Of course, the severe cases should not be allowed to try locomotion for a number of weeks or months after the beginning of the stage of recovery. After the child is allowed to walk it must be frequently seen and examined to guard against the beginning of any deformity. Too often these cases pass from the care of the physician or surgeon only to return a year or more later with serious deformity.

A chief object of this paper is to show the need of careful, skilful, persistent, and prolonged treatment of the victim of infantile paralysis; and to maintain that, if such treatment is given, the cripple will arrive at the final stage of permanent paralysis without preventable deformity and with his disability reduced to a minimum. When the victims are children

of the poor it is very questionable whether such treatment can be carried out in their homes. Certainly the severe cases require a prolonged residence in a hospital or institution equipped for their care.

Of the treatment of paralysis in its final stage I shall not here deal. Suffice it to say that the orthopedic surgeon can accomplish much in enabling the cripple to dispense with heavy and costly apparatus, to secure muscle balance and to produce stability of the joints, so that function approaches nearer and nearer to the normal. And here again time and skill and patience are required. And finally the cripple must be assisted in securing an education and in learning to earn a livelihood that he may at length take again the normal position in life from which he was in infancy thrust out by an untoward accident.

This present epidemic of infantile paralysis has cast into our midst many helpless children who will require our sympathy, our charity, our watchful care through many years.

THE TREATMENT OF CARRIES OF THE SPINE BY BONE TRANSPLANTS. A REPORT OF TWENTY-THREE CASES¹

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WITHIN the past four years a lively interest has been awakened in the treatment of tuberculosis of the spine by operative interference, due to the splendid results reported by Albee from the use of bone transplants. The operation has been urged as a means of hastening more rapid formation of a firm bony ankylosis of the affected vertebræ, thus shortening the duration of the treatment, with a reduction in the resulting deformity.

In an endeavor to ascertain how far these results have been obtained in the patients treated, a collection was made of 23 cases operated upon in the services of Dr. A. P. C. Ashhurst at the Episcopal and Orthopædic Hospitals of Philadelphia, between the years 1912 and 1916.

Of these 23 cases, 1 was operated on in 1912, 6 cases in 1913, 9 cases in 1914, and 7 cases in 1915. The patients ranged in age from two to twenty-nine years.

The results obtained have been classed as "excellent" where there is an apparent arrest of the disease, firm bony ankylosis, no pain and an improvement in the patient's general condition. The results are "moderately good" in those case where pain has been relieved, where ankylosis is fairly well established, but where, for one reason or another, the patients are still

¹ Reprinted from the Am. Jour. of Orthop. Surg., 1916, xiv, 450.

under hospital supervision. The “poor” results are in those patients who have shown no improvement or have retrogressed since the operation, being under hospital care constantly.

Results.	No. cases.	Per cent.
Excellent	7	35
Moderately good	3	15
Poor	1	5
Indifferent as to operation	8	40
Died as result of operation	1	5
Not traced or too recent to consider	3	

Combining the “excellent” and the “moderately good” results as those benefited by the operation, there is a total of 50 per cent. of patients improved.

Of the 6 cases which died under treatment, 1 patient died of acute miliary tuberculosis in forty days after operation; 1 of ether pneumonia in forty hours after operation; 3 patients died of tuberculous meningitis in seventeen days, two months, and three months respectively; and 1 case of secondary sinus infection twenty-six months after operation.

In 7 cases the dorsal region was involved, the dorsolumbar region in 10, the lumbar in 4, and the lumbosacral region in 2 cases.

A study of the following condensed case histories again emphasizes the fact that this operation should not be performed on a patient under five years of age. Of the 6 deaths occurring in this series, 5 cases were under five years of age, the sixth case being just five.

Moreover, the question of the efficacy of the operation in any but the most carefully selected cases, suggests itself. As a rule, the patients who have benefited from the operation were those who were seen and operated upon a few weeks or months after the symptoms were first noted. As part of the operative treament, they were put to bed with extension, fresh air and forced feeding, and later wore a plaster jacket followed by a brace, for a year or more. Certainly we have all seen incipient tuberculous cases in which, under such treat-

ment, and without an operation, as firm an ankylosis of the diseased vertebræ was secured as in any of these operative cases.

The danger of arousing and disseminating a more or less latent infection by the trauma of the operation is more grave than has been generally conceded. Even in those cases where the operation has been most successful in ankylosing the vertebræ, the good results in several instances have been only local, the disease soon appearing in a new focus (see Cases II, IV, and VII). In other words, the disease is arrested locally but not generally.

CASE I.—C. R., aged two years. Dorsal region involved. Condition first noted six months before admission. Treated in the hospital for two months by rest in bed before operation on September 23, 1912. Patient died forty hours after operation of ether pneumonia.¹

End-Results. Patient died from the effects of the anesthetic.

CASE II.—E. N., aged three and one-half years. Lumbar region involved. Trouble first noted six weeks before admission. Treated in the hospital by Buck's extension from March 24, 1913, until operation on April 30, 1913. Patient discharged wearing a Taylor brace but developed a psoas abscess after being about on her feet for a year, and died of exhaustion from sinuses with secondary infection in June, 1915.

End-Results. Indifferent as to operation. Patient died after two years of progressive disease.

CASE III.—J. S., aged four years. Dorsal region involved. Trouble first noticed three months before admission. Treated in the hospital for three years with plaster jackets until operation on June 19, 1913. Patient wore a Taylor brace for one year after the operation. When last heard from in April, 1916, was in excellent condition and had not worn a brace for over a year.

End-Results. Excellent.

CASE IV.—A. H., aged four years. Dorsolumbar region involved. Kyphosis noticed one year before admission. Patient had never walked. Treated in the hospital on Bradford frame and Buck's extension for four months before operation on August 13, 1913. Sent to Atlantic City wearing a Taylor brace and able to walk. Was readmitted to the hospital in January, 1915, and

¹ With our present knowledge this death probably should be attributed to acidosis.—ED.

again in April, 1915, with symptoms of advancing tuberculous disease.

End-Results. Indifferent as to operation.

CASE V.—J. S., aged ten years. Lumbar region involved. Trouble began by a fall from a third story window seven years before admission. Operation performed on August 21, 1913. Mother reports in March, 1915, that patient is going without support, has no pain, is active and eats well. Ankylosis firm.

End-Results. Excellent.

CASE VI.—M. F., aged twenty-four years. Lumbar region involved. Patient was struck by a trolley car five months before admission. Treated in the hospital by Buck's extension for twenty-two days before operation on August 22, 1913. Wore a Taylor brace for one year after operation, after which he was able to do his work as a carpenter until January 11, 1916, when he was readmitted to the hospital with a discharging sinus at the lower end of the kyphosis. Patient states that he was well until he fell and struck his back two weeks before admission. A Wassermann test at this time showed a positive +4 reaction. Patient was put on mercury and iodides and later given an intravenous injection of neosalvarsan. The sinus rapidly healed and patient again is able to do his regular work as a carpenter.

End-Results. Excellent.

CASE VII.—M. F., aged four years. Dorsolumbar region involved. Trouble began two years before admission. Treated in the hospital for two and a half months before operation on August 27, 1913. Sent to Atlantic City wearing a Taylor brace. In 1915 was reported in a home for incurables with a kyphosis some distance above that of the operation. Her general condition is fair.

End-Results. Moderately good.

CASE VIII.—E. C., aged four years. Dorsolumbar region involved. Kyphosis first noticed eighteen months before admission. Treated in the hospital for six weeks before operation on June 27, 1914. Discharged wearing a Taylor brace and readmitted March 9, 1915, with symptoms of advancing disease. After a short stay in the hospital was discharged in good condition. In January, 1916, x-ray shows bone transplant still firmly anchored in spinous processes of six vertebræ. Kyphosis has nevertheless increased, since, to about the same deformity as before. However, the patient wears no brace, and is free from symptoms.

End-Result. Indifferent.

CASE IX.—J. S., aged four years. Dorsolumbar region involved. Trouble began three months before admission. Treated in the hospital for one month before operation on June 18, 1914. Patient died on August 4, 1914, in the hospital, of tuberculous meningitis.

End-Result. Indifferent as to operation.

NOTE.—On July 30, 1914, a piece of protruding bone was cut from the upper end of the transplant. The stump of the transplant bled, showing vascularization of the transplant to the point of removal in forty-two days.

CASE X.—E. C., aged four and one-half years. Dorsal region involved. Has had kyphosis with intermittent attacks of paraplegia for one year before admission. Treated in the hospital for two months before operation on May 20, 1914. Discharged wearing a Taylor brace and when last heard of, in February, 1916, was in good condition. Patient not wearing brace.

End-Result. Excellent.

CASE XI.—J. G., aged three years. Dorsolumbar region involved. Kyphosis noticed one year before admission. Treated in the hospital on Bradford frame and Buck's extension for two months before operation on July 23, 1914. Patient was in the hospital for nine months after operation and was then sent to Atlantic City, wearing a Taylor brace, where he is still in a sanatorium.

End-Result. Moderately good.

CASE XII.—E. McB., aged four years. Lumbosacral region involved. Patient had had previous treatment for a tuberculous wrist, which had cleared up before admission for spinal symptoms of one month's duration. Treated in the hospital on a Bradford frame and Buck's extension for two months before operation on September 30, 1914. Discharged wearing a Taylor brace, and when last seen in January, 1916, was in excellent health and had not worn the brace since June, 1915. Ankylosis was firm.

End-Result. Excellent.

CASE XIII.—J. W., aged seventeen years. Lumbar region involved. Condition began one year before admission. Treated by rest in bed and plaster jackets for seven months before operation on October 31, 1914. A cold abscess was found at operation between spinous processes. Patient has worn a Taylor brace ever since operation and has received constant attention for a discharging sinus at the lower end of the wound. Patient's general condition is poor.

End-Result. Poor.

CASE XIV.—J. O., aged three years. Dorsal region involved. Trouble began six months before admission. Treated in the hospital by Buck's extension for three months before operation on October 31, 1914. Patient discharged in good condition, and when last heard of in May, 1916, ankylosis was firm, but patient showed moderate grade of spasticity of both lower extremities with markedly increased reflexes.

End-Result. Moderately good.

CASE XV.—R. W., aged three years. Dorsal region involved. Trouble began eighteen months before admission. Treated in the hospital on a Bradford frame and Buck's extension for two months before operation on November 4, 1914. When last heard of, in December, 1914, patient was doing well.

End-Result. Not traced.

CASE XVI.—M. L., aged two years. Dorsolumbar region involved. Treated in the hospital on a Bradford frame and Buck's extension for two months before operation on November 18, 1914. Discharged wearing a Taylor brace and died at home in February, 1915, of tuberculous meningitis.

End-Result. Indifferent as to operation.

CASE XVII.—H. S., aged three years. Dorsal region involved. Kyphosis first noticed six months before admission. Treated in the hospital for seven weeks before operation on January 27, 1915. Temperature remained high after operation and condition gradually grew worse, the child dying on March 9, 1915, of acute miliary tuberculosis.

End-Result. Indifferent.

CASE XVIII.—E. U., aged thirteen years. Dorsolumbar region involved. Pain began two weeks before admission. Treated in the hospital for one month by Buck's extension before operation on February 17, 1915. Discharged wearing a brace, and when last seen, in February, 1916, was in excellent condition, ankylosis firm, no pain, and gaining in weight.

End-Result. Excellent.

CASE XIX.—N. B., aged five years. Dorsal region involved. Trouble began two years before admission. Treated in the hospital by Buck's extension for six weeks before operation on April 28, 1915. Patient grew rapidly worse and died of tuberculous meningitis on May 15, 1915. Wound was found healed when cast was removed after death.

End-Result. Indifferent as to operation.

CASE XX.—S. N., aged twenty-four years. Dorsolumbar region involved. Trouble began two months before admission. Treated in the hospital by Bradford frame and Buck's extension for two weeks before operation on May 7, 1915. Discharged wearing brace and when last heard from, in June, 1916, was in good condition. Ankylosis was firm but the lower end of the transplant is unduly prominent. Has not worn his brace for three months and has gone back to his work as a carpenter.

End-Result. Excellent.

CASE XXI.—J. M., aged twenty-nine years. Lumbosacral region involved. Fifteen months before admission patient had right breast removed for carcinoma. Eight months ago had some glands removed from the left axilla, which were diagnosed by the laboratory as carcinoma and tuberculosis. Complained of pain in lumbosacral region for four weeks before operation on May 29, 1915. Wound sloughed after operation and condition grew worse until, on December 14, 1915, the graft was caught at the exposed lower end with forceps and pulled out *in toto*. The wound has healed slowly since then but the patient is confined to bed and growing more cachectic daily. Recurrent carcinomatous growths on chest are held in check by x-ray treatments.

End-Results. Indifferent as to operation.

CASE XXII.—S. S., aged two years. Dorsolumbar region involved. Kyphosis first noticed four weeks before admission. Treated in the hospital on Buck's extension and Bradford frame for four months before operation on October 20, 1915. Patient is now wearing a Taylor brace and is up and about ward, but psoas abscess present before operation shows no tendency to be absorbed.

End-Result. Too recent to consider.

CASE XXIII. H. McG., aged twenty-nine years. Dorsolumbar region involved. Pain first noticed two years before admission. Treated in the hospital for three weeks before operation on October 27, 1915. Patient discharged wearing a Taylor brace and is at present in good physical condition.

End-Result. Too recent to consider.

THE REFRACTION OF THE EYE: A STATISTICAL REPORT OF ONE HUNDRED CASES SELECTED IN NUMERICAL ORDER

By D. PELLMAN BOYER, M.D.

ASSISTANT IN THE OPHTHALMIC DEPARTMENT OF THE HOSPITAL

THE refraction of the eye is a very difficult subject in which to interest the average reader of medical literature. Even the ophthalmologist is inclined to treat it with more or less disdain, and it has come to be looked upon in the general view of eye clinics as that part of the work which inevitably falls to the lot of the new man and thus forms the drudgery of the routine duties. In spite of all this, however, no one can deny that it is a very important part of our service and it includes by far the greater number of cases we see in our daily work, especially in our private offices. Moreover, it is a subject of the highest economic importance in which this hospital by reason of its situation shares in a very unusual degree; and so the writer may be pardoned for presenting a subject so indifferently regarded.

Believing, however, that the class of cases which are treated in this institution are somewhat unusual in the annals of clinical hospital service, it seems worth while compiling a table of statistics comprising 100 cases selected in the order in which they have been entered upon our records. We have said that our cases are unusual and we believe this to be true for perhaps there is no other institution in this city where by far the greater number of patients represent a highly intelligent class of industrious working people. Perhaps 98

per cent. of these speak English, are fairly well educated, and are generally employed in industrial pursuits where constant near work is the rule. The inevitable result of this is, of course, all sorts of ocular disturbances not the least of which demand the careful refraction of the eye.

These patients are an odd lot as far as their attitude toward the hospital is concerned: Our endeavors are looked upon as a natural right, which they assume is theirs without the asking and entirely without thanks. This is unfortunate, at least in our respect, because it belittles the quality of the service we are capable of rendering them and they are not able properly to differentiate between the work of the ophthalmologist and the optometrist. This in itself offers an educational field which has been very much neglected and it is not at all unusual to find that our patients have been duped by some ignorant eye-glass peddler before they are finally obliged to consult us.

Another erroneous idea which prevails among this class is the harmful effects of drops, which they are told by the optometrist are a great menace to the sight. We constantly find objections raised when a mydriatic is prescribed and there are no doubt a considerable number who rather than submit to this treatment never return to the hospital but fall into the hands of the refracting optician.

The following 100 cases are probably representative of the total obtained at the refracting table and will in most respects conform with those we could select from our private practice.

There were 52 cases of compound hyperopic astigmatism, 15 cases of compound myopic astigmatism, 16 cases of simple hyperopia, 5 cases of simple myopia, 12 cases of mixed astigmatism.

This ratio follows closely the proportion of the various forms of ametropia given by many investigators.

According to one popular authority 40 per cent. of ametropic eyes have compound hyperopic astigmatism, 8 per cent. compound myopic astigmatism, 20 per cent. simple hyper-

opia, 1.5 per cent. simple myopia, 6.5 per cent. mixed astigmatism.

Of astigmatism with the rule we found 46 cases; against the rule, 23; and of the symmetric form, 21.

In the entire series none of either the simple hyperopic or myopic forms were discovered.

What concerns both the physician and the patient more particularly, however, than the special variety of ametropia existing is the terminal result in vision.

We obtained in this group of cases: 6/6, or normal vision in 55; 6/9, in 17; 6/12, in 10; 6/15, in 10; 6/21, in 4; 6/60, in 1.

We are particularly gratified by this display as it will be seen that practically 75 per cent. of these results produced almost normal vision while in the majority of those remaining very appreciable improvement was obtained.

A PRELIMINARY STUDY OF A SERIES OF WARD
CASES ILLUSTRATING THE VALUE OF ROUTINE
OPHTHALMOLOGICAL EXAMINATIONS
IN ALL CASES ADMITTED TO
THE HOSPITAL

BY DAVID JOHN BOON, M.D.
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IN view of the numerous examinations that are made routinely in hospital cases, it has seemed to us that one important source of information has been more or less overlooked. Realizing that a fundus examination is usually postponed until all other clinical and laboratory findings have been obtained and exhausted, we have taken up a study of a series of cases to find out whether or not a routine examination of the eye-ground would be of sufficient value to justify the extra work performed.

We have selected the medical cases, admitted to the hospital, during November, 1916, as the first of these series. The following examinations of fifty medical cases admitted to the hospital wards show:

1. A fair percentage (20 per cent.) of serious eye lesions in which ocular conditions were not suspected.

2. A relatively high percentage of fundus conditions in cases diagnosed as *cardiorenal affections*. The fact that these lesions were not discovered, and therefore not taken into consideration from the standpoint of prognosis especially, seems to us to be of some importance.

While it is a matter of record that a large percentage of renal and cardiorenal cases come to necropsy, without any fundus lesions; yet in cases where fundus lesions do occur and are present, we have a better basis for prognosis, and our case is more thoroughly studied by having an ophthalmoscopic examination. Taking the large number of pneumonia cases reported, in all but a very few we find, from the laboratory reports, decided urinary changes; albumin in varying amounts, also casts, both granular and hyaline.

Upon making fundus examinations we find only an extremely small proportion have any serious changes in the eye-ground. This negative report to my mind should be valuable, but if we should find only one or two in which retinal, choroidal, or arterial changes were occurring we should be well repaid for the care we had taken in making the routine examinations of the eye-grounds. Early fundus changes are danger signals in any form of disease, their absence may mean nothing, but their presence does, and it is our duty to find out whether or not they exist.

In addition to the value a routine fundus examination may have at the time of first making, consider the value to any clinician making a study of a series of renal or cardiorenal cases from your hospital records. No study of such cases should be considered complete without the fundus examinations any more than a study of lues would be complete without a Wassermann.

Negative results occur in both, but positive findings convey a vast amount of information. Lack of data in studying medical cases is always deplorable and inexcusable. Now that we have our *urine*, *Wassermann*, *blood*, *sputum*, *feces* and other examinations, why not add the fundus examination and complete the clinical picture.

While an examination of 500 to 1000 cases may be required to prove our contention as to the value of a routine examination, we feel that the 50 cases covered so far show that there

are many ocular conditions that come into our medical wards which could be detected in no other way.

Our suggestion would be that on admission all medical cases and cases of serious head injuries in the surgical wards receive a routine examination of the eye-ground and in that way we could secure more complete examinations and more comprehensive records.

PNEUMONIA CASES

No.	Name.	Age.	Diagnosis.	Blood-pressure.	Urine analysis.	Fundus examination.
1	A. W.	32	Pneumonia and pleurisy	134-77	Heavy cloud of albumin; hyaline and granular casts; no sugar	O. D. Negative. O. S. Negative.
2	C. B.	32	Pneumonia	103-73	Heavy cloud of albumin, hyaline and light granular casts; no sugar	O. D. Negative. O. S. Negative.
3	A. A.	32	Pneumonia	133-100	Heavy cloud of albumin; hyaline and light granular casts; no sugar	O. D. Negative. O. S. Some physiological cupping.
4	H. S.	52	Pneumonia	101-60	Heavy cloud of albumin; hyaline and granular casts; no sugar	O. D. Negative. O. S. Negative.
5	W. B.	20	Pneumonia and hypo-pituitary disease	118-80	Heavy cloud of albumin; many light granular casts; no sugar; Wassermann negative	Double optic atrophy and other retinochoroidal changes; there is a perivasculitis with the evidence of old retinal hemorrhages more marked in the left eye.
6	J. K.		Pneumonia	111-66	Heavy cloud of albumin; granular and hyaline casts; no sugar	O. D. Pale nerve; nothing in the macular region. O. S. Large amount of disturbance down to the nasal side; nerve is paler than normal, especially in the periphery.
7	L. W.	48	Pneumonia	142-87	Light cloud of albumin; hyaline casts; no sugar	O. D. Nerve slightly swollen and some slight edema of the retina. O. S. Negative.
8	C. R.	32	Pneumonia	109-47	Light granular casts; hyaline casts; light cloud of albumin; no sugar	O. D. Negative. O. S. Nerve slightly paler to the temporal side.
9	J. D.	60	Pneumonia	153-79	Heavy cloud of albumin; hyaline and granular casts; no sugar	O. D. Negative. O. S. Negative

10 11	J. O. C. L.	38 34	Pneumonia Pneumonia	112-68 118-80	Negative. Light granular and hyaline casts; light cloud of albumin; no sugar Heavy cloud of albu- min; no sugar; no casts Faint cloud of albu- min; no sugar; occa- sional light granu- lar casts Heavy cloud of albu- min; many hyaline and granular casts; no sugar Fine trace of albu- min; few light gran- ular casts; no sugar LUES	O. D. Negative. O. S. Negative. O. D. Negative. O. S. Negative.
12	R. L.	49	Pneumonia and myocarditis	157-98		O. D. Cornea and media clear; pupil moder- ately well dilated; vascular reflex normal. O. S. Negative.
13	W. M.	40	Pneumonia	155-80		O. D. Retinal and vascular reflex normal; nerve grayish white, especially to the tem- poral side. O. S. Same condition in O. S.
14	J. M.	23	Pneumonia	105-80		O. D. Retina is congested. O. S. Some slight swelling of the retina; nerve is much paler than normal, but probably due to the physio- logical cupping.
15	H. V.	35	Muscular dystro- phy and pneu- monia	175-90		O. D. Vascular and retinal reflex normal; edges of the nerve indistinct; disk swollen about one diopter. O. S. Same.
16	E. H.	21	Lues	120-65		O. D. Edges of the nerve are blurred, especially to the lower temporal edge; the nerve is slightly swollen. O. S. Cornea and media clear; edges of the nerve well defined, except the upper nasal quadrant, where there seems to be some swelling.
17	W. G.	42	Lues	125-70		O. D. Nerve poorly defined; nerve yel- lowish white, especially to the temporal side. O. S. Negative; has Argyll-Robertson pupil.
18	K. B.	31	Lues and arsenic poisoning	120-70	Trace of albumin; faint ring of albu- min; few hyaline and granular casts; Wassermann +4 Trace of albumin; faint ring of albu- min; few hyaline and granular casts; Wassermann +4	O. D. Cornea and media clear; large amount of disturbance in the retinal pigment, espe- cially to the nasal side; there is a decided increase in the tortuosity of the small vessels, which one would not expect in a man of his age; nerve of good color; here and there are a few changes in the bloodvessels. O. S. Retina shows disturbance and a considerable absorp- tion of the retinal pigment; increase in the tortuosity of the vessels.

LUES—CONTINUED

No.	Name.	Age.	Diagnosis.	Blood-pressure.	Urine analysis.	Fundus examination.
19	W. H.	27	Lues	115-60	Mild cloud of albumin; many leukocytes; no sugar; occasional dark granular casts; Wassermann negative	O. D. Negative. O. S. Negative.
20	J. W.	28	Lues	125-70	Faint trace of albumin; no sugar; few light granular casts; Wassermann +4	O. D. Retina is very much roughened, and is undergoing some changes; here and there are several small glistening bodies, very much resembling crystals of cholesterol, there is some disturbance of the retinal pigment and the edges of the nerve are blurred; the vessels, especially the arteries, are more tortuous than one would expect is a man of his age. O. S. Same condition, not so marked.
21	J. E.	47	Tabes dorsalis (lues)	142-91	Negative	O. D. Cornea and media clear; pupil moderately well dilated; there is some pigmentation surrounding the nerve; nerve is pale, especially to the temporal side. Nothing in the macular region. O. S. Same condition in O. S. Nerve paler than normal and also paler than O. D.; retina is hazy, with little or no involvement.
22	J. L.	21	Lues (chancere)	120-95	Negative; Wassermann +4	O. D. Negative. O. S. Some slight disturbance of the retina in the macular region; retina in the macular region is roughened; macula prominent, showing considerable congestion; disturbance of pigment all over the entire retina; the nerve is well defined.
23	L. B.	43	Myocarditis	125-75	Trace of albumin; few light granular casts; no sugar	O. D. Negative. O. S. Negative
24	G. L.	57	Myocarditis	138-100	Trace of albumin; alkaline reaction; Wassermann negative; no sugar	O. D. Slight degree of arterial sclerosis. O. S. Same condition.

25	J. S.	59	Myocarditis	124-79	Heavy cloud of albumin; few granular casts; no sugar	O. D. Negative. O. S. Negative.
26	T. M.	64	Myocarditis	121-72	Trace of albumin; hyaline casts; no sugar	O. D. Nerve is swollen; large area of retinal choroidal atrophy; there are hemorrhages in the macula; the entire retina is swollen; has a posterior staphyloma.
27	H. D.	56	Myocarditis	145-90	Trace of albumin; alkaline reaction; no sugar	O. D. Pupil well dilated; vascular and retinal reflex normal; nerve is slightly paler than normal, especially to the temporal side; nothing in the macular region. O. S. Enucleated.
28	E. A.	74	Myocarditis	125-75	Light cloud of albumin; hyaline and granular casts; no sugar	O. D. Negative. O. S. Negative.
CARDIORENAL						
29	J. S.	51	Cardiorenal	121-76	Trace of albumin; hyaline casts; no sugar	O. D. Very slight swelling of the retina. O. S. Negative.
30	R. D.	69	Cardiorenal	144-50	Light cloud of albumin; few hyaline casts; no sugar	O. D. Some slight swelling of the retina, with large number of pigment changes, especially at the basal periphery; nerve is slightly swollen and slightly paler than normal; some slight changes in the macular region. O. S. Little or no swelling of the nerve; there are many pigmentation disturbances, showing a tessellated eye-ground, and there is evidence of retinal changes.
31	A. R.	58	Cardiorenal	125-70	Heavy cloud of albumin; granular, epithelial, and hyaline casts; no sugar; Wassermann negative	O. D. There is an edema of the retina, with evidence of old hemorrhage; there is decided absorption of the retinal pigment, especially in the base of the fundus. O. S. Shows old hemorrhage in the macular region.
32	A. L.	58	Nephritis, myocarditis, bronchial asthma	142-97	Heavy cloud of albumin; many hyaline and granular casts; no sugar	O. D. Negative. O. S. Negative.

CARDIORENAL—CONTINUED

No.	Name.	Age.	Diagnosis.	Blood-pressure.	Urine analysis.	Fundus examination.
33	W. E.	63	Uremia	165-90	Hyaline and granular casts; heavy cloud of albumin; no sugar	O. D. Marked swelling of the retina, with some swelling of the nerve and decided arteriosclerotic changes; the vessels are tortuous and the walls thin. O. S. Same condition in O. S.
34	J. M.	20	Endocarditis (aortic stenosis)	Arm (120-40) Leg (190-70)	Heavy cloud of albumin; light granular casts; Wassermann negative; no sugar	O. D. Tessellated eye-ground; absorption of the retinal pigment; pulsation of the artery can be seen at the nerve head. O. S. Same.
35	R. S.	22	Typhoid	147-95	TYPHOID CASES	
36	A. H.	25	Typhoid	107-65	Trace of albumin; no sugar; few hyaline casts	O. D. Large amount of pigment disturbances at the nasal periphery; nerve well defined; nothing in the macular region. O. S. Negative.
37	J. D.	22	Typhoid	120-50	Heavy cloud of albumin; no casts; no sugar	O. D. Pupil moderately well dilated; cornea and media clear; some congestion of the retina, with a slight amount of swelling of the nerve. O. S. Negative.
38	A. Y.	22	Typhoid	118-65	Faint ring of albumin; no casts; no sugar Negative	O. D. Retinal reflex pale; vascular reflex about normal; edges of the nerve defined. O. S. Negative.
39	W. J.	56	Bronchitis, incisional hernia	147-95	MISCELLANEOUS CASES	
40	E. R.	62	Aphasia	92-59	Trace of albumin; few hyaline casts; no sugar	O. D. Cornea and media clear; retinal and vascular reflex normal; nerve is paler than normal, surrounded with an unusual amount of pigment. O. S. Same but not so marked.
						O. D. Marked arterial sclerosis; some slight cupping; nerve grayish white, especially to the temporal side; all vessels are arteriosclerotic. O. S. Retina very granular, with amount of pigment disturbance; nerve is pale, especially to the temporal side; all vessels are arteriosclerotic, as shown by the increased tortuosity.
						O. D. Very large absorption of the retinal pigment; nerve is grayish white, especially in the periphery; vessels are small and tortuous, showing a decided degree of arterial sclerosis; choriocapillaris can be seen. O. S. Same condition.

41	M. L.	55	Alcoholic neuritis	116-60	Light cloud of albumin; no casts; no sugar	O. D. Some arterial changes; one small hemorrhage below and to the temporal side of the disk; hemorrhage very minute near the terminal of a small artery. O. S. Negative. O. D. Fundus negative; some disturbance of the retinal pigment, but not so marked. O. S. Cornea and media clear; nerve well defined, some disturbance of the retinal pigment, especially down to the nasal side; the retinal pigment is so disturbed you can see the choriocapillaris.
42	W. L.	27	Diabetes	120-90	Faint trace of albumin; sugar +8 per cent.; no casts; Wassermann +3	O. D. Retinal and vascular reflex normal; slight pigment change with a grayish-white nerve, especially to the center of the temporal side; nothing in the macular region. O. S. Same condition in O. S.
43	L. C.	39	Lead colic	119-92	Trace of albumin; no casts; no sugar	O. D. Negative. O. S. Negative.
44	W. G.	50	Psoriasis arthropathique	136-83	Trace of albumin; no sugar; hyaline casts	O. D. Negative. O. S. Negative.
45	W. Z.	14	Chorea	115-60	Light cloud of albumin; no sugar; few hyaline and light granular casts	O. D. There is an extreme paleness of the retina; nothing pathological. O. S. Negative.
46	J. L.	22	Follicular tonsillitis	121-93	Light cloud of albumin; hyaline and light granular casts; no sugar	O. D. Cornea and media clear; pupil moderately well dilated; nerve indistinct; nerve is a light bluish white; there is a large pigment disturbance; tessellated eye-ground. O. S. Same condition in O. S.
47	A. F.	30	Aortic regurgitation	168-48	Trace of albumin; occasional hyaline casts; no sugar	O. D. Slight congestion of the retina, which is more pronounced in the left eye.
48	A. W.	32	Chronic lead poisoning	120-90	Trace of albumin; occasional hyaline casts; no sugar; Wassermann negative	
49	W. F.	74	Apoplexy	119-92	Heavy ring of albumin; many leukocytes; no casts	O. D. Pigment very much disturbed; subsiding neuroretinitis; beginning haze of the lens. O. S. Same condition.

IMPLANTATION CYST OF THE ANTERIOR CHAMBER OF THE EYE

By HAROLD G. GOLDBERG, M.D.

OPHTHALMIC SURGEON TO THE HOSPITAL

IN November, 1914, a boy, aged six and a half years, was brought to the Episcopal Hospital for treatment with the following history: Earlier in the day he had been struck in the right eye with the point of a carpet tack upon which he had been hammering, which resulted in a small punctured wound of the eyeball. The wound was situated at the limbus, 6 mm. above the horizontal plane, on the temporal side; into it the iris had prolapsed, and an attempt to replace this part failing, it was excised by means of a De Wecker scissors. Thereafter the healing was uneventful, and four days later he was discharged from the hospital. Seventeen months after the receipt of the injury the mother noticed a blister-like body appearing in the region of the original wound, which in one month's time increased so rapidly in size that she again applied at the hospital for treatment. Upon this latter occasion it was found that the right eye was irritable, there was photophobia and lacrimation, the deeper vessels of the eye were injected, and there was a fine corneoscleral zone of purplish-red discoloration, particularly pronounced in the region of the wound. The wound was now observed as a grayish-brown pin-point at the corneoscleral juncture, 6 mm. above the horizontal plane on the temporal side of the eyeball, *i. e.*, the original site of the injury. The cornea contained no opacities, the iris reacted promptly to light, the pupil was black and round, the lens and vitreous clear, and the fundus negative. The vision at this time equalled $\frac{5}{9}$. Occupying the upper temporal quadrant of the anterior chamber there appeared a cyst-like growth, about 5 by 8 mm. in size. Its anterior, superior, inferior and internal lateral walls were composed of a delicate, translucent, grayish-white membrane, while its external



FIG. 54.—Showing cyst and wound of entrance.



FIG. 55.—Appearance of cyst after first recurrence and condition of pupil following iridectomy.

lateral and posterior walls were formed by the cornea, sclera, and anterior surface of the iris respectively. The growth was perfect in outline, being somewhat bean-shaped, and its free surface was seen to be encroaching slightly upon the pupillary area. Its shape and size were not affected in any way by the action of the iris; it contained neither wrinkles nor folds, and its contents were so clear that, but for its delicate walls, the details of the iris could be plainly seen. Thus it was found that the iris underlying it had undergone some atrophic changes, and by reflected light the growth was somewhat transilluminated by the thinning of its iritic portion.

The child was immediately admitted to the hospital, and the usual routine examination and study carried out. The family and personal history was negative. The child was well nourished, of normal mental development, and the head, thorax, abdomen and extremities were all negative.

The day following the admission of the patient to the hospital, after the usual preparation, the child was operated upon under ether anesthesia. An iridectomy including the entire extent of the cyst had been planned, and believing that this would best be accomplished, by first evacuating the cyst of its contents, and allowing it to collapse, the blade of a Hays knife needle was thrust into the cyst cavity, about 1 mm. above the limbus, turned upon its axis, and the contents of the cyst allowed to escape. The fluid was perfectly clear, not unlike in any respect the aqueous humor. This step in the operation having been accomplished, and no appreciable effect made upon the depth of the anterior chamber, a broad keratome was entered at the corneoscleral juncture, including in its scope the approximate extent of the cyst body. The delicate cyst walls were withdrawn piecemeal, the growth being so fragile that it immediately disorganized upon the slightest traction, a generous fold of iris was withdrawn and excised, its angles replaced, and the eye dressed in the usual manner and without accident.

The day following, the wound was found closed, the anterior chamber reformed, there was no reaction, the coloboma was perfect in outline, and its angles well defined. That portion of the posterior surface of the cornea against which the surface of the cyst wall had impinged, displayed a fine milky white opacity, as though its layer of endothelium had in some way been disturbed. The anterior capsule of the lens had the same appearance, and in addition, some fine light brownish deposits which seemed to indi-

cate that the removal of the cyst had not been complete. The subsequent healing and progress of the case were uneventful, and six days later the patient was discharged from the hospital.

Through some misfortune the iris section and cyst fragments were lost and so a laboratory examination of this specimen was not made.

The patient was kept under observation, and it was noted, that both the opacity of the cornea and lens were growing less distinct, and it, therefore, seemed hopeful that after all the complete removal of the cyst had been accomplished. Such was not the case, however, as three months later the mother observed the appearance at the old site, of a growth, about the size of a pin-head, which increased so rapidly that she again brought the child to the hospital. Upon this occasion the child was held for observation, and it was noted, that the cyst was growing very much more rapidly than upon its first appearance. The vision at this time equalled $\frac{6}{8}$ partly, there was no pain, but intense and almost constant itching, which symptom, it seems, was the first to attract the attention of the mother to the recurrence of the growth. There was no injection of the vessels of the eyeball, the cyst was situated somewhat lower down, it was semilunar in shape, and had otherwise the same general characteristics as upon its first appearance. By its downward growth it had detached the lower angle of the coloboma, and seemed to be invading the substance of the iris, presenting the appearance of having split the iris into two parts, the retinal pigment layer forming its posterior wall, the anterior limiting membrane its anterior wall, the whole forming a portion of the pupillary margin. The size of the cyst at this time was about 1 cm. by 0.5 cm., the lens and vitreous were clear, the fundus was normal, and with the ophthalmoscope no trace of the growth could be seen within the vitreous chamber.

The child was again prepared for operation, etherized, and this time no attempt was made to evacuate the cyst, the section of the cornea was proceeded with at once, was accomplished without difficulty, but was immediately followed by the prolapse of a bead of vitreous, obscuring the field of operation, and considerably complicating the subsequent steps. An effort was made to withdraw a fold of the iris, including as much of the cyst as possible, but the operation as originally planned, failed, and instead the iris and cyst came away only in fragments. It was believed that this prolapse of the vitreous was due to a tilting of the lens posteriorly upon its axis, caused by the downward pressure of the cyst, so

further attempts to search for the remaining cyst fragments seemed useless, and the vitreous was excised and the wound closed.

The specimen was mounted on a slide and examined without staining. It revealed a mass of tissue made up of iris stroma, and a glistening, striated, intercellular substance resembling the limiting membrane. This membrane, which was assumed to be the cyst wall, contained in its substance isolated pigment connective tissue cells, groups of lymphocytes, and joined the larger pigmented areas, the iris stroma, together. It seemed to blanket, as it were, the entire stroma proper, and could be seen after tearing, between the separated pigmented cells, as though they had been enmeshed within its folds.

The day following the operation the wound had closed, the anterior chamber was reformed, there was so little reaction that scarcely a bloodvessel appeared upon the sclera, the lens was clear, and it was doubtful whether any remains of the cyst could be seen, owing to the feathery-like opacity of the cornea overlying the region of the growth. The iris coloboma was ragged, with an unattached tag at its lower free border. The subsequent healing was prompt and uneventful, and in a few days the patient was discharged from the hospital.

The child has since been under constant observation, and up until the present time, two months after the operation, the eye has remained quiet, and there has been no evidence of any recurrence of the growth. The feathery-like opacity of the cornea persists without any change, the tension of the eyeball has been restored, and the vision equals $\frac{6}{8}$ partly.

The specimen was sent to the laboratory, sectioned and stained with hematoxylin and eosin, and Van Gieson's stain. A microscopic examination of a longitudinal section revealed the following: the retinal pigment layer of the iris was not much disturbed, it was somewhat thinned by stretching, but was otherwise intact. Superimposed upon this layer, occupying the position of the stroma layer, was a well arranged stratified layer of epithelial cells, polyhedral in form at their base, becoming squamous in character as the anterior surface was approached. This surface formed the internal wall of the cyst, and so far as its structure remained was about all that could be seen of it. The cells were healthy in character, took the nuclear stain deeply, and seemed to have interposed among them, fibers resembling elastic tissue. The stroma layer appeared to have been entirely destroyed, only remnants of it

remained, a few chromatophores. In transverse section, there seemed to be an excessive amount of new connective tissue, quite cellular in type, which enclosed well-defined islands of epithelial cells and groups of lymphocytes.

From the clinical aspect of this case and from the microscopic findings it would appear to be an implantation cyst not differing in many respects from those which have already been described in the literature on this subject. According to Parsons, the possibility of these implantations has been proved experimentally by various investigators. It has also been shown that in addition to successful implantation of epithelial structures and their subsequent transition into cystic developments, fragments of cornea have also been known to take root within the confines of the anterior chamber and give rise to what have been called pearl tumors. Both of these features have been displayed in the case here recorded, as indicated by the excessive amount of new connective tissue and the presence of elastic fibers. Since this case was seen and operated upon in a comparatively early stage of its development, the final changes as described by the writers who have recorded similar cases have not had a chance to appear. The relationship to injury seems to have been particularly noted by all those with whose names the implantation theory is especially associated. Rothmund, in 1871, collected 36 cases, in which 28 had a perforating wound; in 3 there were eyelashes in the anterior chamber, in 2 cysts followed cataract operations. The cases of the pearl tumor type of new growth are composed, histologically, of solid concentric lamellæ of epithelium arranged like the layers of an onion. Becker reported a cyst with compact walls, many elastic fibers, and lined with flattened epithelium. Stölting described two epithelial cysts, and pointed out the possibility of continuity of the epithelium with that of the surface by downward growth along the lips of the wound into the anterior chamber. Parsons states that the contents of these cysts are generally a serous or slightly turbid fluid, and in these cases the iris is often split

into two layers; the anterior is often adherent to the back of the cornea, and is usually thin and atrophic. The posterior layer constitutes the greater part of the iris and forms the posterior wall of the cyst, which is, as usual, lined with irregular and often ill-developed stratified epithelium. This, when best developed, sometimes closely resembles the corneal or conjunctival epithelium, the cubical cells covering the iris and the flattened cells lining the cavity. These characteristics appear to have been exhibited in every detail, both clinically and microscopically, in the case here recorded. It therefore seems fair to classify it as an implantation cyst of both epithelial and corneal tissue constituents, the direct result of a punctured wound with the transference of these two elements into the anterior chamber.

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HERPES ZOSTER CORNEALIS

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On August 19, 1916, a man, aged forty-eight years, entered the hospital for treatment of the right eye, giving the following history; The patient states that during the last week in May he visited the country, staying there about one week. Ten days after his return he noticed a small red spot developing on the cornea. This gradually became larger and a vesicle formed which turned into a scab. All during this process the affected area was becoming larger and gradually spreading over the cornea, thus affecting his vision to a great extent. No pain was experienced during all this time, except for a frontal headache, but he did complain of a scratching sensation which became very annoying at times. Seven days after the appearance of the spot on the cornea small blotches appeared along the course of the supra-orbital nerve. They started as small red areas which developed into vesicles and then into scabs. Eleven days after the lesion appeared on the cornea he decided to consult a physician. After examination a diagnosis of ivy poisoning was made. He was given a lotion to apply and the lesions gradually disappeared, leaving after them some small scars.

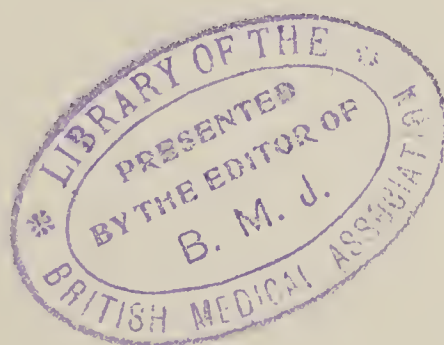
The patient becoming alarmed about his loss of vision decided to seek aid at the Episcopal Hospital, where he was admitted and assigned to Dr. Goldberg's service and the following condition noted: A number of scars along the course of the supra-orbital nerve, showing a recent herpes zoster. One half of the cornea (temporal side) was covered with a heavy white membrane, which resembled very much the vitelline membrane of the egg and was totally insensible to pain and touch. The cornea was very thin at the center almost to the point of rupture, but the outer edges seemed to be increased in thickness. Pieces of the membrane could be lifted off at times but reformed within a few hours, por-

tions of which were sent to the laboratory, but were returned with a negative result.

While in the hospital the membrane was curetted off several times and a saturated solution of iodoform and ether was applied, the membrane reappearing within a few hours.

The patient was discharged from the hospital September 21, 1916, as improved and told to visit the dispensary for further treatment. The course pursued in the dispensary has been as follows: The eye is thoroughly cocainized with a 4 per cent. solution and then 95 per cent. alcohol is applied directly to the affected area. Partial regeneration of the cornea has taken place and the area which looked as if it might rupture has increased in thickness and become more firm. The regenerative process is probably due to a series of small bloodvessels which have gradually worked their way to the affected area.

Vision at present time (November, 1916) is 5/15 partly.



THE PROGNOSIS AND COURSE OF LENTICULAR OPACITIES

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THE presence of opacities in the crystalline lens is usually viewed with considerable alarm and apprehension as to the ultimate termination in mature cataract and consequent loss of vision. This doubtless arises from the fact that those who formulate the prognosis in cases of this nature are usually thrown in contact only with those that attain surgical prominence, and on account of the overwhelmingly large numbers of these, they assume that the number of cases of lenticular opacities that do not go on to complete opacification of the lens must be negligible indeed. Occasionally it so happens that a patient sufficiently prominent socially develops lenticular opacities, but to the embarrassment of the prognosticators lives to enjoy the privilege of having the opacities undergo spontaneous absorption, and, not infrequently, while under the mystic manipulations of some member of one of the irregular cults of "rubbers."

Even those cases in which the lens is directly injured by the entrance of a minute foreign body, or by the prick of a needle, do not always go on to complete opacification of the lens. Of greater rarity are those cases in which a luxated, more especially a partially luxated, lens retains a certain degree of transparency.

The great bulk of opacities of the lens is to be seen in the course of very careful routine examinations in people past forty-five years of age. Nearly all these patients show increased density of the lenses by the great ease with which

the anterior and posterior capsules are determined by oblique illumination. Such patients show a grayish-greenish reflex in the pupillary area, but glaucoma is not to be entertained in connection with them even though their accommodation is disproportionate to their age. Disturbances in the ocular circulation are attendant phenomena. The choroidal ring shows an increase in pigment and the choroidal vessels are very prominent. The vitreous also shows considerable haze.

In many of these cases, when the pupil is dilated by cocaine or euphthalmin, numerous spoke-like opacities are shown in the periphery contrasted with the dull nuclear haze. These often assume a cobweb structure instead of radiating. At times they may appear as dots in the lens.

The cases just described appear in great numbers in the offices of the ophthalmologists if not in their clinics, and the prognosis is of great importance. Should the diagnosis of incipient cataract be made and the patient so informed the patient is likely to confuse it with "cataract," and picture to himself all the terrors of that condition. This has often resulted disastrously. It is well-known that a considerable number of these cases are arrested in their progress, and the patient goes through the rest of his or her life with less than normal vision, although as good as the vision of the average aphakic patient.

Under the heading "spontaneous absorption of opacities in the crystalline lens," cases have been reported from time to time, and occasionally complete bibliographic articles have been written covering this entire subject. The reporting of this particular case, and the allied cases following it, is prompted by the rather recent circumstance of a well-known Philadelphia financier regaining his sight at the hands of an osteopath, as he alleges, after his condition had been diagnosed as cataract by two leading and reputable ophthalmologists, and being advised to consider operation and to prepare for it in a short time. The patient in this instance sought aid from those that advertised themselves the most, as a business man

might be expected to do, and he was not disappointed in the advertisement, since the result obtained was the same as guaranteed in the advertisement, all because the more regular practitioners had failed to appreciate a physiological process, absorption, and to make due allowance for its possible occurrence to a practical degree.

The case history of my patient reads:

J. D., aged fifty-seven years, musician and church organist by occupation, referred by Dr. Leon Brinkman of Philadelphia, on account of failing vision, monocular diplopia, and annoying subjective color phenomena. The vision in right eye was $5/22.5$, and in left eye, $5/12$, with pronounced recession of the near point in both eyes. The vision, from his stand-point, was so far impaired that he could not perform his daily routine with any degree of satisfaction or accuracy.

Detailed examination at this time, with the pupils dilated by a drop of euphthalmin solution, showed the lids, conjunctiva, lacrimal apparatus, and extraocular muscles to be normal. The cornea was clear, the tension normal, the anterior chamber of average depth in both eyes. Prior to the instillation of the mydriatic the reactions of the pupils to the ordinary stimuli of light, accommodation and convergence were normal, prompt and free. The mydriatic caused almost complete dilatation of both pupils, exposing to view in each eye a well-defined, swollen, rather dense lens with spoke-like opacities extending from periphery toward the center, but not as yet invading the center. Segmentation of lens was demonstrable, but no central linear or other opacities were observed.

Examination of the vitreous and fundus was entirely negative. The condition of the extraocular muscle balance was expressed by 9 degrees interni, 9 degrees externi, 2 degrees superior recti, 2 degrees inferior recti, orthophoria in the horizontal and vertical planes. Examination of the fields for white, red and green, in both eyes, showed them to be normal and without the presence of any abnormal scotomata.

Examination of the refraction at this time (May 29, 1913) gave the following formula:

$$R., +0.75 \text{ S.} +0.50 \text{ C. ax. } 90^\circ = 5/7.5$$

$$L., +1.00 \text{ S.} = 5/7.5$$

$$\text{Add } +3.00 \text{ S. both eyes} = 0.50 \text{ M. type at 35 centimeters.}$$

Approximately three months later the patient returned with all the disturbances of vision (inability to read, or see at distance without diplopia or color sensations) exaggerated and intensified. Another detailed examination showed nothing abnormal except an increase in the cloudiness of the lens. The changes in the lens were further indicated by a change in the refraction. Thus at this time (August 4, 1913) we find:

$$\begin{aligned} & \text{R., } 5/60 + 0.25 \text{ S.} + 0.50 \text{ C. axis } 90^\circ = 5/45 \\ & \text{L., } 5/45 + 1.00 \text{ S.} = 5/30 \\ & \text{Add } +4.00 \text{ S. both eyes} = 0.50 \text{ M. type at 30 centimeters.} \end{aligned}$$

A short time later the refraction registered (October 7, 1913):

$$\begin{aligned} & \text{R., } 5/22.5 + 1.00 \text{ S.} + 0.50 \text{ C. ax. } 180^\circ = 5/12 \\ & \text{L., } 5/22.5 + 1.00 \text{ S.} + 0.25 \text{ C. ax. } 180^\circ = 5/9? \\ & \text{Add } +3.00 \text{ S.} = \\ & \text{R., } 1.25 \text{ M. type} \\ & \text{L., } 1.00 \text{ M. type at 30 centimeters.} \end{aligned}$$

The changes in the crystalline lenses were indicated by the change in the axes of the cylinders, by the acceptance of a cylinder in a previously spheric defect, and by the alteration of the near point. Despite these findings on the test letter charts, the vision obtained was of very little practical importance to the patient. He could get about without aid, but could not read papers or books, nor could he follow his vocation as church organist and music teacher. He was more than partially disabled—in his case he was totally incapacitated. It was possible to demonstrate increasing opacity of the peripheral portions of both lenses, worse in the right eye, in which it was encroaching upon the center. Position, projection and perception were good in all parts of the field. The patient was prevailed upon to give up attempts at near work and to try to build up his general health while awaiting maturation of the cataract, which was unquestionably present, although incipient in character. The low vision and monocular diplopia prevented him from accomplishing anything, but until this date he had persisted in attempts to do so.

Two months later (December 27, 1913) the darkening in the periphery of the lens was found to be increasing, while the center seemed a trifle clearer than at the previous examination. The refraction at this time showed:

$$\begin{aligned} & \text{R., } 5/15 + 1.00 \text{ S.} + 0.50 \text{ C. ax. } 180^\circ = 5/7.5? \\ & \text{L., } 5/22.5 + 1.00 \text{ S.} + 0.25 \text{ C. ax. } 180^\circ = 5/9? \\ & \text{Add } +3.00 \text{ S. both eyes} = 1.00 \text{ M. type at 35 centimeters.} \end{aligned}$$

It should be borne in mind in considering this case that the vision fractions obtained represent the maximum vision obtained under the best circumstances with all the encouragement the examiner could supply in the way of suggestive letters, etc. (academic vision, so to speak), while in reality the patient was able only to distinguish gross objects. Otherwise this case becomes very commonplace, since a 5/9 vision is ordinarily sufficient for anyone, and there is no point to this record. A variety of lenses was tried and ordered, with the idea of increasing visual acuity, but to no purpose. The subjective tests were discarded and retinoscopic results were used, but these were also found to vary, and were ignored for the time.

Two months later (February 5, 1914), detailed examination with dilated pupil showed the lenses to be clearing in the periphery and the spoke-like opacities to have disappeared in many places. The refraction at this date showed:

$$\begin{aligned} \text{R., } 5/15 + 1.00 \text{ S.} + 0.50 \text{ C. axis } 180^\circ &= 5/7.5 \\ \text{L., } 5/15 + 1.00 \text{ S.} + 0.25 \text{ C. axis } 180^\circ &= 5/9 \\ \text{Add } +3.00 \text{ S. both eyes} &= 0.50 \text{ M. type at 35 centimeters.} \end{aligned}$$

It will be noted that here occurred a definite increase in vision without correction, taken under the same circumstances as former examinations, even to the time of day of the examination.

At the next examination (May 1, 1914) the patient reported that he was able to do a fair amount of near work with comparative comfort, and that the diplopia had ceased. Detailed examination under a mydriatic (euphthalmin) showed the crystallin lenses to be almost entirely clear. The eyes were normal in every other particular. The refraction, estimated objectively and subjectively, showed:

$$\begin{aligned} \text{R., } 5/15 + 1.00 \text{ S.} + 0.50 \text{ C. ax. } 180^\circ &= 5/9 + \\ \text{L., } 5/15 + 1.25 \text{ S.} + 0.25 \text{ C. ax. } 180^\circ &= 5/9 \\ \text{Add } +3.00 \text{ S. both eyes} &= 0.50 \text{ M. type at 35 centimeters.} \end{aligned}$$

At a subsequent examination (August 27, 1914) the visual results were found to be constant, and the patient returned to work, the same kind of work he had discontinued one year previously, and, with his near point arranged for a comfortable working distance by the addition of $+1.75$ S. instead of $+3.00$ S., he was able to retake his place in the world as a wage earner.

Recently (August 24, 1915) he was examined and the crystallin lenses were found to be entirely clear. He had continued uninter-

ruptedly at his work without the slightest disturbance of vision, and without diplopia. His refraction at this time showed:

R., 5/22.5+, +1.50 S. + 0.50 C. ax. 180° = 5/5?
 L., 5/15? +, +1.50 S. + 0.50 C. ax. 180° = 5/5?
 Add +3.00 S. both eyes = 0.50 M. type at 35 centimeters.

Detailed examination at a later date (November 10, 1916) showed both lenses clear in the pupillary area, the fundus was normal throughout in both eyes, but the refraction had changed however and required the following lenses for its correction:

R., 5/22.5+1.25 S.+0.50 C. ax. 90° = 5/5
 L., 5/12 +1.25 S.+0.50 C. ax. 90° = 5/5
 Add +2.50 S. both eyes = 0.50 M. type at 35 centimeters.

The first point in this record is the early recognition of the causes of apparently trivial disturbances of vision that resist ordinary treatment in persons past middle life. The second point of importance is the distinction between purely conventional or academic vision, as expressed by the test type, and vision of a practical or elastic character that would permit of the pursuance of a vocation normal to the particular individual. The third point is the value of ocular rest in the stage of swelling in incipient cataract. In this case the swelling subsided, the segments of the lens assumed the normal close apposition so that all opacification disappeared. This further emphasizes the fact that all incipient cataracts do not progress toward maturity.

It may be noted, in passing, that in one of the intervals between his visits, one of his friends, with his permission, circulated a request among five thousand people for a certain prayer daily for the restoration of his vision. He naturally attributed his recovery to this source.

Somewhat allied to this case is one observed by the writer, in which pronounced lenticular changes remained comparatively stationary, as regards vision, over a period of twenty-five years. During this period the segmentation of the lens arranged and rearranged itself like a kaleidoscope many times, but a careful examination of the refraction would serve to bring the clear part of the lens to the highest state of efficiency.

The history was, briefly, the patient, a seamstress by occupation, was fifty-two years of age when she first consulted me in 1904. Fourteen years previously she had been examined at the University Hospital, Philadelphia, by Dr. William F. Norris, who informed her she had cataracts and to prepare herself for operation, as nothing else would be of any permanent value. One of his assistants at that time, Dr. Wallace, however, took upon himself the task of examining the patient's refraction and, to his great astonishment, found he could improve her vision to almost normal. He prescribed glasses and continued to do so at frequent intervals for a number of years to within a short time of the patient coming under my observation.

In 1904 she consulted me, not because of a failure of Dr. Wallace's method, but on account of other reasons, with a long list of symptoms, including frontal headache, lacrimation, recession of the near point, asthenopic symptoms, migraine, nausea and diplopia. Detailed examination of both eyes showed frank, unmistakable, incipient cataract in each eye, with numerous radiating linear opacities. The fundus was normal. Encouraged by Dr. Wallace's experiment, the refraction was carefully examined and showed:

$$\begin{aligned} \text{R., } 4/15 + 0.50 \text{ S. } - 0.75 \text{ C. ax. } 90^\circ &= 4/9 \\ \text{L., } 4/15 + 0.25 \text{ S. } - 0.50 \text{ C. ax. } 90^\circ &= 4/12 + \\ \text{Add } +2.75 \text{ S. both eyes} &= 0.62 \text{ M. type at 35 centimeters.} \end{aligned}$$

(Transposition of the distance correction would not give the same distance vision as the arrangement given, a peculiarity of all cataract refraction, whether before or after removal of the crystalline lens.)

This correction was ordered and worn for fifteen months, when vision with it was found to have changed to: R., 4/12; L., 4/15, and near vision consisted in reading the 1.00 M. type at 35 cm. Distance vision without correction was the same as formerly.

The refraction was found to have changed to:

$$\begin{aligned} \text{R., } +0.25 \text{ S.} \\ \text{L., } +0.25 \text{ S.} \\ \text{Add } +3.00 \text{ S.} &= 0.75 \text{ M. type at 35 centimeters.} \end{aligned}$$

Two years later (1907) the lenticular opacities appeared to have increased in size. The refraction then registered:

$$\begin{aligned} \text{R., } 5/15? + 1.00 \text{ S. } - 1.00 \text{ C. ax. } 90^\circ &= 5/12 \\ \text{L., } 5/22.5 + 0.25 \text{ S. } - 0.75 \text{ C. ax. } 90^\circ &= 5/22.5 \\ \text{Add } +3.25 \text{ S. both eyes} &= 0.75 \text{ M. type at 30 centimeters.} \end{aligned}$$

At the end of another period of two years (1909) another formula was obtained, namely:

$$\begin{aligned} & \text{R., } 5/15 - 0.50 \text{ S.} + 1.00 \text{ C. ax. } 30^\circ = 5/9? \\ & \text{Add } +4.50 \text{ S.} = 0.75 \text{ M. type at 28 centimeters.} \\ & \text{L., } 5/22.5 + 0.25 \text{ S.} - 0.75 \text{ C. ax. } 150^\circ = 5/15 \\ & \text{Add } +3.50 \text{ S.} = 0.75 \text{ M. type at 28 centimeters.} \end{aligned}$$

In 1911 the examination showed:

$$\begin{aligned} & \text{R., } -0.25 \text{ S.} + 1.75 \text{ C. ax. } 180^\circ = 5/12? \\ & \text{Add } +3.75 \text{ S.} = 0.75 \text{ M. type at 25 centimeters.} \\ & \text{L., } -0.25 \text{ S.} - 1.50 \text{ C. ax. } 60^\circ = 5/15 \\ & \text{Add } +4.00 \text{ S.} = 0.75 \text{ M. type at 25 centimeters.} \end{aligned}$$

One year later (1912) the refraction showed other changes:

$$\begin{aligned} & \text{R., } 5/15 + 1.25 \text{ C. ax. } 45^\circ = 5/9? \\ & \text{L., } 5/15? - 1.00 \text{ C. ax. } 60^\circ = 5/15 \\ & \text{Add } +4.00 \text{ S. both eyes} = 0.75 \text{ M. type at 35 centimeters.} \end{aligned}$$

After a lapse of another year (1913) the formula read:

$$\begin{aligned} & \text{R., } 5/15 - 0.75 \text{ S.} + 1.25 \text{ C. ax. } 90^\circ = 5/12? \\ & \text{L., } 5/22.5 + 0.50 \text{ S.} - 1.25 \text{ C. ax. } 180^\circ = 5/22.5 \\ & \text{Add } +3.75 \text{ S.} \\ & \text{R., eye} = 0.75 \text{ M. type at 30 centimeters.} \\ & \text{L., eye} = 1.00 \text{ M. type at 30 centimeters.} \end{aligned}$$

The notes then read that the cataract in the left eye was maturing, and the patient was so informed.

Approximately ten months later (1914) the ametropia equaled:

$$\begin{aligned} & \text{R., } 5/30 - 1.00 \text{ S.} + 1.25 \text{ C. ax. } 90^\circ = 5/12? \\ & \text{Add } +3.75 \text{ S.} = 0.75 \text{ M. type at 30 centimeters.} \\ & \text{L., } 5/30 + 0.75 \text{ S.} - 1.00 \text{ C. ax. } 180^\circ = 5/15 \\ & \text{Add } +3.75 \text{ S.} = 1.00 \text{ M. type at 30 centimeters.} \end{aligned}$$

In June, 1915, the examination showed:

$$\begin{aligned} & \text{R., } 5/15 + 0.75 \text{ C. ax. } 150^\circ = 5/12 + \\ & \text{L., } 5/30 + 0.25 \text{ S.} + 0.75 \text{ C. ax. } 120^\circ = 5/15 \\ & \text{Add } +3.75 \text{ S. both eyes} = 0.75 \text{ M. type at 35 centimeters.} \end{aligned}$$

In April, 1916, the patient returned for observation and her vision without any correction was 5/15 5/30. It was impossible to make out any details of the fundus although the red reflex was visible between the opacities in the lenses. A mydriatic was

instilled for purposes of examination and the error of refraction was corrected by the following:

$$\begin{aligned} \text{R., } 5/15 + 1.00 \text{ C. ax. } 150^\circ &= 5/12 \\ \text{L., } 5/30 + 0.75 \text{ C. ax. } 120^\circ &= 5/15 \end{aligned}$$

After the effect of the mydriatic had passed off the vision with this correction was 5/15 in each eye, and with the addition of +3.75 S. in each eye, she could read the 0.75 M. type at 35 cm.

The patient was advised on more than one occasion within the last three years to prepare, financially and otherwise, for operation, but barring a few intervals, due to other causes, has continued almost uninterruptedly in the pursuit of her vocation as dress-maker and seamstress. Of late she has delegated the finer work to other hands, partly on account of tiring of the eyes it caused, and partly by reason of an intention to conserve the sight.

Another case illustrating this point came under the writer's observation in 1907.

The patient, a woman, aged about sixty-five years, had been under the care of a colleague for several years before, and he had noted at least three years previously opacities involving the entire lower half of the lens in the right eye, and a quadrant, below and in, of the lens in the left eye. When my record began, these were both pronounced and readily demonstrated to any one. Her vision was: R., 5/9; L., 5/12, and with the correction, previously prescribed was: R., 5/9; L., 5/7.5. With the exception of some tear duct trouble on both sides, the eyes were otherwise normal. The refraction in 1907 was expressed by:

$$\begin{aligned} \text{R., } 5/9 - 1.00 \text{ C. ax. } 45^\circ &= 5/7.5? \\ \text{L., } 5/12 - 0.50 \text{ C. ax. } 90^\circ &= 5/6?? \\ \text{Add } +2.75 \text{ S.} &= 0.50 \text{ M. type at 35 centimeters.} \end{aligned}$$

About twenty months later (in 1908), repeated examination of the refraction determined it to be:

$$\begin{aligned} \text{R., } 5/15 - 0.50 \text{ S.} - 0.50 \text{ C. ax. } 90^\circ &= 5/7.5 + \\ \text{L., } 5/9 +, - 0.50 \text{ C. ax. } 90^\circ &= 5/6 \\ \text{Add } +3.00 \text{ S. both eyes} &= 0.62 \text{ M. type at 35 centimeters.} \end{aligned}$$

One year later (1909) her vision, with the same correction, increased to 5/6, 5/6 distance and reading of 0.50 M. type at 35 cm.

In 1911 the following formula was obtained:

R., 5/15-0.75 S.-0.50 C. ax. 90° = 5/9+
 Add +3.50 S. = 0.62 M. type at 30 centimeters.
 L., 5/9 -0.75 C. ax. 90° = 5/6?
 Add +3.00 S. = 0.50 M. type at 35 centimeters.

It was not until 1913, approximately two years later, that the patient noticed any appreciable disturbance of vision. Close work became troublesome. Then a slight change in the formula improved her sight:

R., 5/12-0.50 S.-0.75 C. ax. 90° = 5/9
 Add +3.50 S. = 1.00 M. type at 35 centimeters.
 L., 5/7.5-0.75 C. ax. 90° = 5/5?
 Add +3.50 S. = 0.50 M. type at 35 centimeters.

In 1914 (August 7, 1914) the formula was:

R., 5/15-0.25 S.-1.00 C. ax. 90° = 5/9?
 Add +4.00 S. = 1.00 M. type at 35 centimeters.
 L., 5/9?-0.50 C. ax. 90° = 5/7.5
 Add +3.50 S. = 0.50 M. type at 35 centimeters.

It should be noted that there is a progressive improvement in the vision of the left eye, despite the fact that it was difficult to see the fundus through the opaque lens. A clear center had been maintained in both eyes throughout this entire period.

After a prolonged illness, she was again examined in 1915 (September 30, 1915), and showed:

R., 5/15?-1.25 C. ax. 90° = 5/12
 Add +4.00 S. = 1.00 M. type at 35 centimeters.
 L., 5/9? -0.50 C. ax. 90° = 5/7.5
 Add +4.00 S. = 0.50 M. type at 35 centimeters.

In the spring of 1916 (April 1, 1916) the patient was again examined and the crystalline lens still showed pronounced opacities with the red fundus reflex showing in between. Examination of the refraction gave the following formula:

R., 5/15?-1.25 C. ax. 90° = 5/12?
 L., 5/9? -0.50 C. ax. 90° = 5/9?
 Add +4.00 S. both eyes = 0.50 M. type at 35 centimeters.

At this time there was a pronounced haziness of the entire lens in both eyes, in addition to the numerous opacities, and segmentation of the lens. In this case operation was out of question during the last five years of the condition, for reasons other than ocular, although the tear duct disease might have offered an objection, had extraction been considered. Consequently, it was necessary to find some more simple way of conserving vision. The expense of examination and glasses was of no moment to her, consequently numerous examinations at frequent intervals were made and the glasses changed on the slightest indication of a change in the refraction, with a result at the end of eleven years that seems to have justified this course.

COMMENT. These case histories well illustrate a point occasionally brought forward, to the effect that crystalline lens opacities in persons past middle life do not always progress to full maturity of senile cataract, but that they may remain stationary, or they may undergo incomplete, very rarely complete, absorption. This is manifested by the continuous variations in the refraction; and not uncommonly it is possible to follow up these variations by repeated variations in the correcting lenses. These points borne in mind will often serve to make the way comparatively comfortable for those who are denied the advantage of surgical aid, and will also spare the operative enthusiast the embarrassment mentioned at the beginning of this paper. To the man whose operative skill is unquestioned, therapeutics is reduced to a matter of operative technic, and the natural history of any condition without treatment (or what amounts to the same thing, modern medical treatment) is entirely ignored, yet it must be taken into consideration, if the best all around results are to be obtained.

That lenticular opacities, whether primary or secondary, are inclined to do curious things is again evidenced by the changes in the cortical and capsular remains following ordinary cataract extraction. Sometimes they absorb spontaneously after a long period; sometimes immediate vision (after a month or so) is good, to be followed by opacification of the

shreds in the pupillary area, and proportionate impairment of vision. Again, needling may be sufficient to stimulate absorption of lacerated fragments of capsule and cortical matter. The suggestion is again brought forward that opacities beginning in the periphery and assuming a spoke-like distribution in the course of generalized haziness and apparent segmentation of the lens be given the benefit of the conservative treatment as long as vision of 5/15 can be obtained, and that the diagnosis of incipient cataract be withheld as long as useful vision can be maintained by the use of correcting lenses, reserving the diagnosis for the cases where the progress to maturity from month to month is more pronounced.

BILATERAL CHOKED DISK FOLLOWING THYROIDECTOMY

BY FREDERICK KRAUSS, M.D.
OPHTHALMIC SURGEON TO THE HOSPITAL

EDWARD C., aged twenty-three years, weaver by trade, came to my service in the dispensary of the hospital of the Protestant Episcopal Church on March 30, 1916, with the history of poor vision since having been operated upon for goitre in January. Previous to this, his sight had been perfect. He says he could not recognize a person across the street, having almost continuous attacks of dizziness with intermittent attacks of blindness. The vertigo and blindness were accentuated by any excitement, sudden movement, or change in the position of his body.

The central vision was $5/5$ in the right eye and $5/6$ in the left eye, but the patient at the same time declared that he could not recognize an individual across the room. The attempt to do so would make him dizzy, and everything was black before his eyes. The pupils responded to light and accommodation. The eye-grounds showed marked neuroretinitis in both eyes. In the right eye the disk was markedly swollen, the apex best seen with plus 3 D., the surrounding media with no lens. In the left eye the swelling was greater, the apex being seen with plus 4 D., and the surrounding media with O. The veins were full and tortuous; there was a small hemorrhage down and out. The swelling extended beyond the disk into the retina for about $1\frac{1}{2}$ disk diameter all around its margins.

This swelling of the nerve and retina increased, reaching its height about April 10, 1916, when in the right eye the apex of the disk was seen with plus 4 D., the periphery with zero, the veins very full, tortuous, and completely hidden in spots. The edema of the retina though all around the disk for $1\frac{1}{2}$ disk diameter, extended along the course of the vessels for about 2 disk diameters; beyond this coronal edema about the disk.

In the left eye the swelling of the nerve and retina became decidedly more pronounced, the apex being seen with plus 5 D. The swelling of the retina was decidedly more marked along the

course of the bloodvessels. The fields of vision showed crossed fields for red and white, the red field being abnormally large, with transient scotoma in the periphery. Later they showed contraction for form, with crossing of the red field. At this time he was shown before the section of ophthalmology of the College of Physicians.

The general medical examination by Dr. Hooker was reported as negative. The blood examination was negative. The x-ray showed the ethmosphenoidal cavity large, with a thin roof and flattened clinoid process. The other sinuses were all clear except a possible slight clouding of the left frontal sinus.

The swelling of the disk gradually became less pronounced, the distant vision remaining the same. The patient continued to state that he could not see, though the central vision varied between $5/5$ and $5/6$ in each eye, with accommodation of 8 to 20 inches, with type 0.75 in each eye and 8 to 29 inches binocularly. The patient had a constant expression of worry, and refused to be comforted by my telling him of his excellent showing in the reading tests. The swelling of the disk gradually subsided, so that by May 2, 1916, the edges were markedly indistinct, the apex of the disk being only $+2$ D. higher than the retina. He then had $5/4$ vision and read type 0.25 at 10 inches. When reexamined on October 26, 1916, he showed as follows:

In the right eye the nerve was dirty red gray in tint, with edges of the disk slightly blurred. The vessels were normal in size. The lymphatics about the retinal vessels at their exits were very full, causing a dead white lining about the vessels, in strong contrast with the gray color of the disk. In the left eye the edges of the disk were more distinct, otherwise the appearance was similar to that of the right eye. The fields are slightly and concentrically cut. The patient's general health was greatly improved. He felt well except for occasional slight attacks of dizziness. He thought that his sight was good, his nervousness less pronounced, with complete disappearance of the extreme mental depression and sense of nervous excitement, from which he had suffered.

The hospital records showed that our patient had been operated upon by Dr. Harry C. Deaver, at the Episcopal Hospital, for cystic goitre on January 20, 1916. The history given was as follows:

The patient stated that he had never been ill or injured. His general health was good. Tumor appeared on the neck five or six

years ago, growing gradually larger. It had never been tender nor caused pressure symptoms. He used to smoke cigarettes to excess, to which he attributes the tremor in his fingers.

In the general examination made by the resident, Dr. M. L. Pratt, the temperature and respiration were normal. Pulse, 72.

Head. There was a fine tremor of the lids when shut. The pupils reacted to light, and there was no exophthalmos. Ears, nose, and throat were negative. The tongue was clean and the teeth in fair condition.

Neck. Asymmetrical swelling in the region of the thyroid, which moves on swallowing. Swelling about the size of a lemon on the right side and two-thirds as large on the left. Both sides felt cystic and soft. No tenderness nor evidence of acute inflammation. The skin is not adherent.

Chest. Negative. Heart sounds loud and clear, and of good muscular quality. No murmurs.

Abdomen. Negative.

Extremities. Very fine tremor in fingers.

He was operated on by Dr. Deaver on January 20, 1916. The following is an account of the nature of the operation:

Ether anesthesia. Iodin, 5 per cent. in the ward and in the operating-room. Long Kocher collar incision at the base of the neck. The skin and fascia are then dissected up, so as to expose the thyroid gland. The right sternohyoid is then split and the right lobe enucleated, excepting for a small part of the upper pole. This is then clamped, tied off, and cauterized with carbolic acid and alcohol. The lobe extended down under the sternoclavicular joint and high up, and was very difficult to free. Inferior thyroid artery ligated. Inferior parathyroid seen and felt. Lobe, excepting above, removed. The left sternohyoid was split and the left lobe enucleated with less difficulty. Was not so large. Clamped and ligated at the upper pole. Inferior thyroid artery ligated. Remainder of the lobe is then removed, leaving the neck with the left upper pole, part of the isthmus, and a small portion of the right upper pole. Both lobes were cystic and had undergone colloid degeneration, apparently. Rubber-dam drains in both cavities. Sternohyoid united with interrupted No. 2 chromic catgut. Interrupted silkworm-gut sutures were used in the skin. Iodin, 5 per cent.; sterile dressings are then applied in the usual manner.

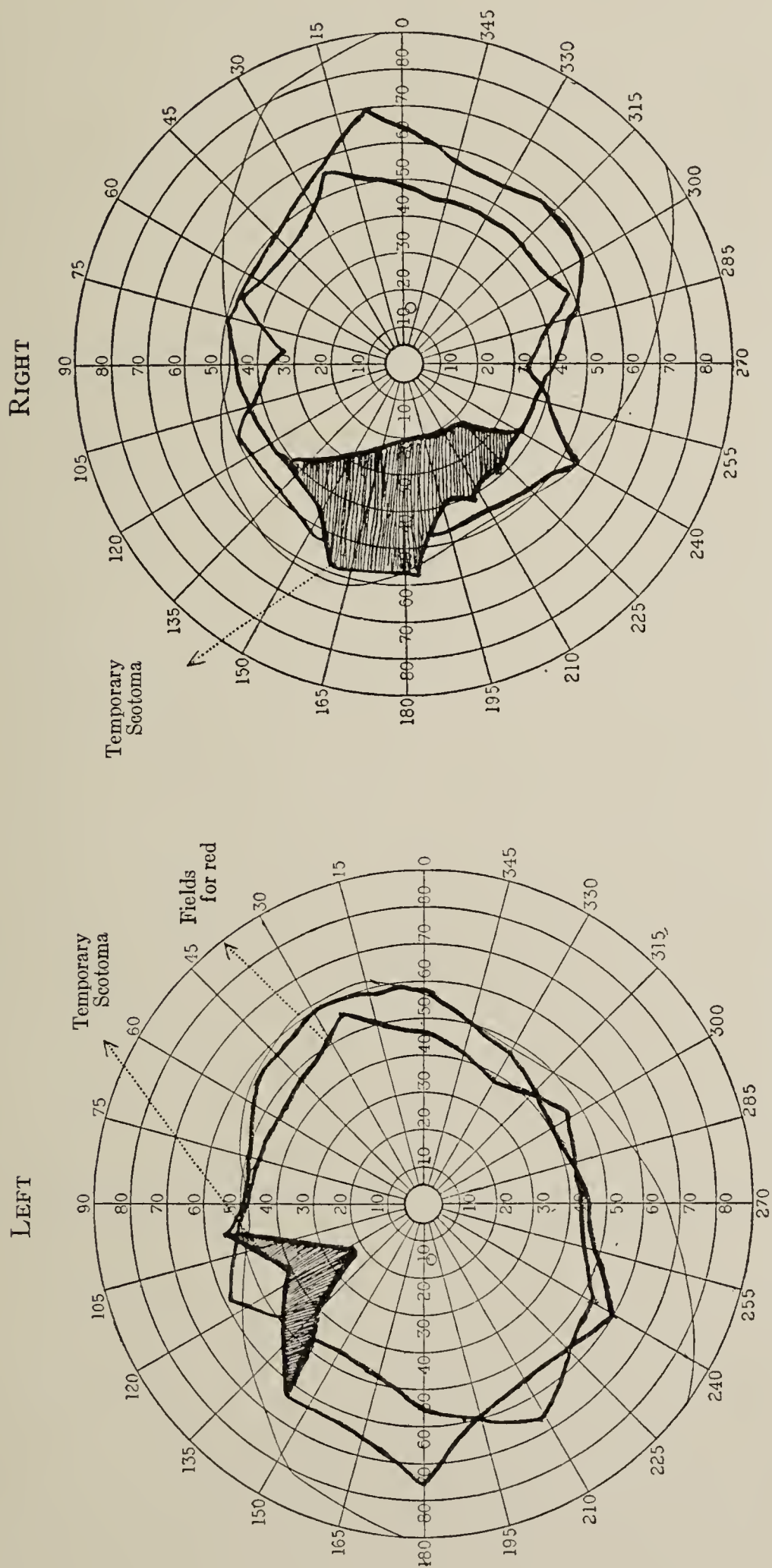


FIG. 56.—Bilateral choked disk following thyroidectomy. Tracings of eye-grounds made April 24, 1916.

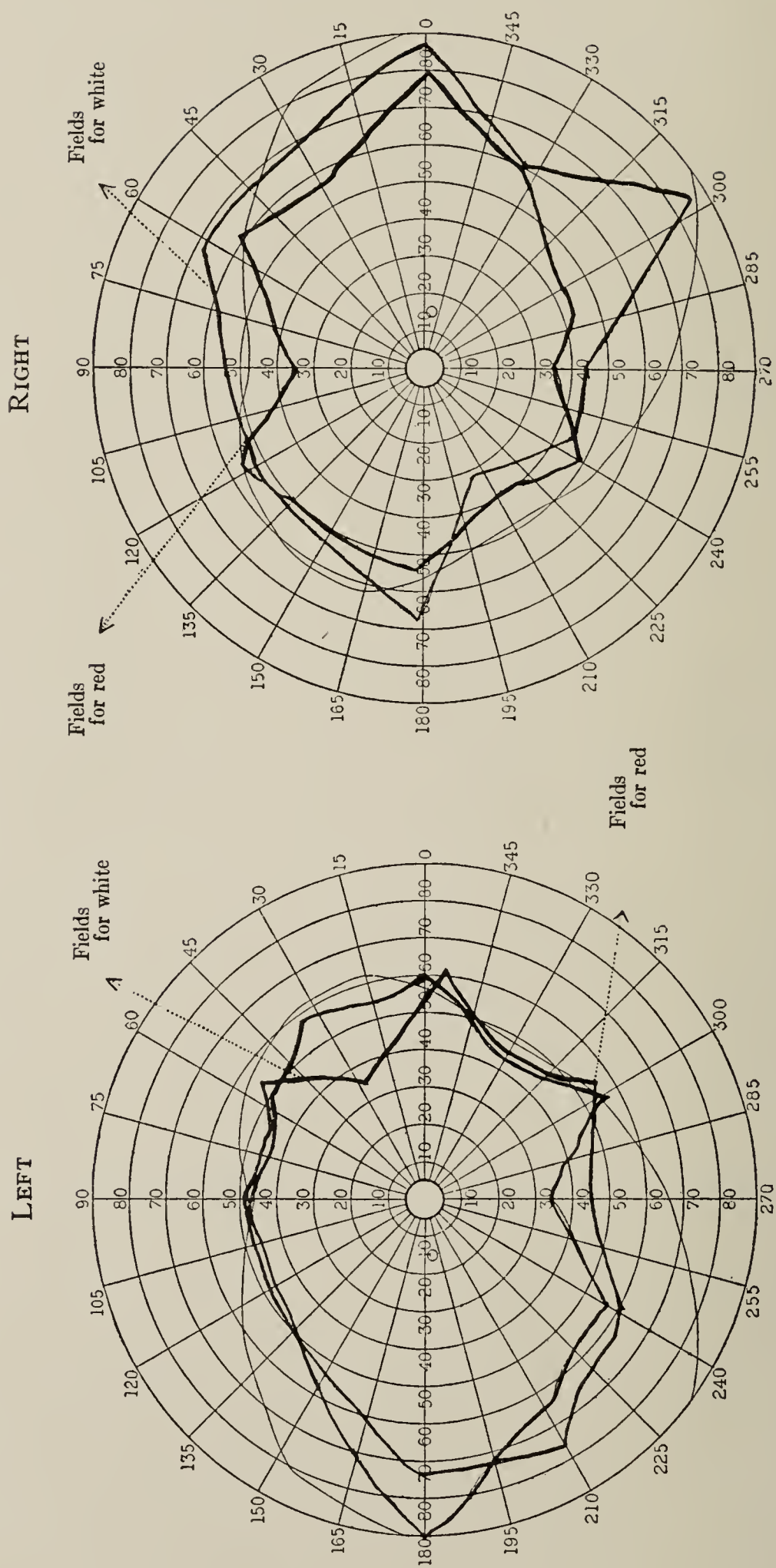


FIG 57.—Bilateral choked disk following thyroidectomy. Tracings of eye-grounds made May 1, 1916.

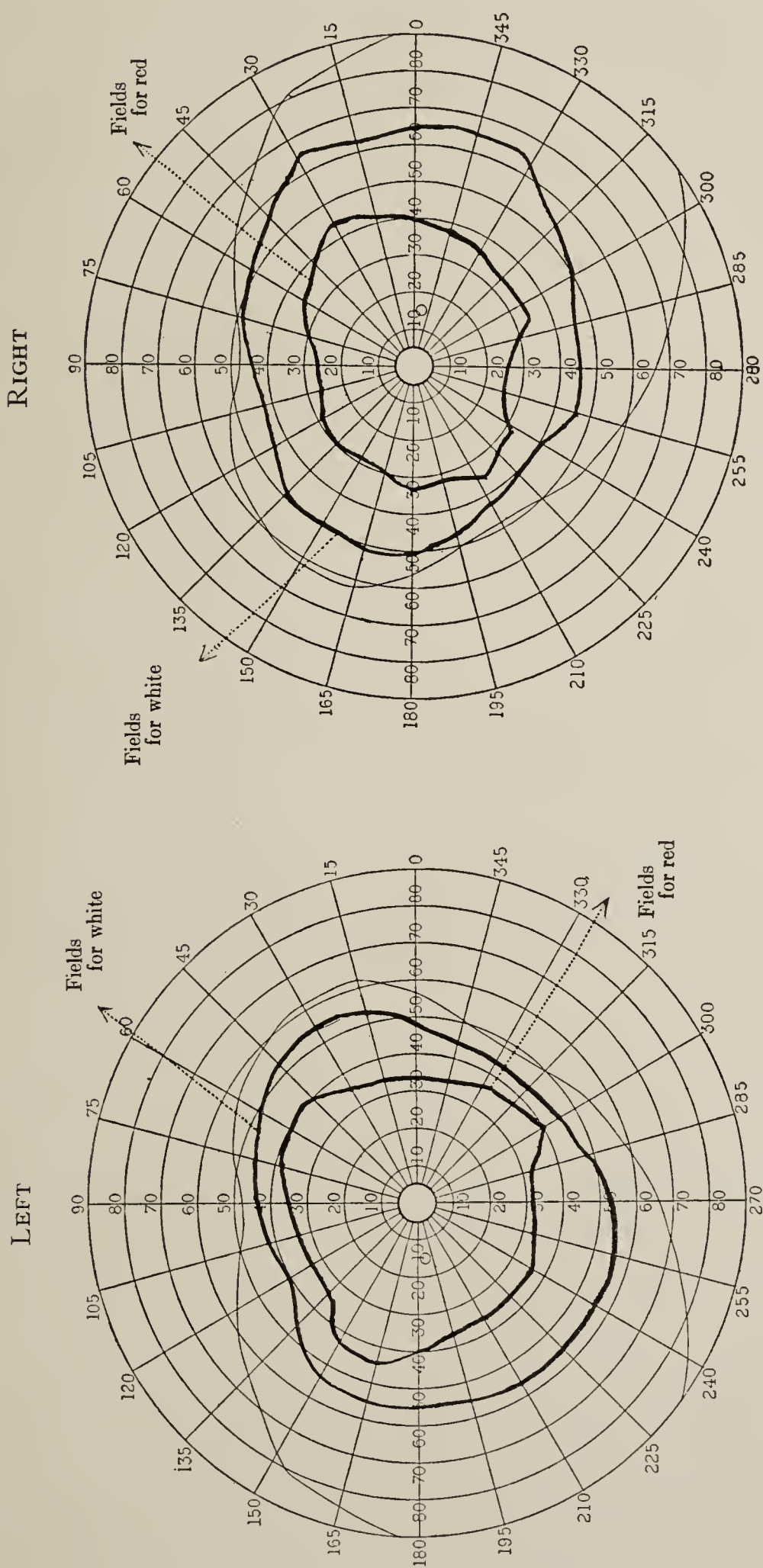


FIG. 58.—Bilateral choked disk following thyroidectomy. Tracings of eye-grounds made October 26, 1916.

The following notes are interesting:

January 21, 1916. Operated on yesterday. Reacted well. Patient is being kept quiet with morphin. Is hoarse but is able to articulate.

January 23. Temperature, 103° ; pulse, 124; respirations, 28 at 4 P.M. today. Is still very nervous and requires morphin twice a day. Is perspiring very freely. Complains of a tingling sensation in the feet.

January 25. Patient is semi-irrational; perspires freely. Has forced extension of the first two fingers and the thumbs are flexed over the palms (obstetrical hand). Toes are in forced extension. Marked tremor of the muscles. Has some difficulty in swallowing.

January 27. Little better this afternoon after chloral and bromides by rectum. Perspiring less. Can swallow better. Muscular contraction has now disappeared. Still has a tremor of the muscles. Has been despondent since the operation.

January 28. The wound is being dressed daily and the stitches removed today. Has a small point of infection around many of the suture entrances, probably due to perspiration, but no discharge from the deep parts. General condition improved over yesterday, but he has some incontinence of urine and feces. Realizes this and it worries him considerably.

January 30. Patient feels and says that he is better. Is hungry. The wound infection remains about the same.

February 2. Patient is very hungry and the mental condition is much improved. No incontinence of urine or feces for the past three days. Still has muscular tremor of the first two fingers on both hands.

February 4. Mental condition of the patient is good. Says he feels fine. Eats very well. Temperature, pulse, and respirations normal. Sleeps fairly well, with sedative enema. Muscular tremor is much less.

February 9. Patient up two days ago. General condition is fine. The wound is about all healed. Discharged. Still has a very fine tremor of the muscles, but practically no more than before the operation. The appetite is excessive.

SUMMARY. This patient had a cystic thyroid, which was removed by a careful and experienced operator. Following this he had a severe attack of tetany, with excessive mental excitement and incontinence of urine and feces. His ocular condition was not noted until eight weeks after the operation,

when he showed marked neuroretinitis, the so-called choked disk, with extension of the swelling along the course of the retinal vessels. This swelling increased for six weeks, then gradually subsided. A distinctive feature of his visual fields was a slight cutting for form and an abnormally large field for color.

The subsidence of the neuroretinitis was followed by a low grade of optic-nerve atrophy, with a moderate degree of cutting of the form fields. The color fields do not cross now, and he has full visual acuity. The treatment consisted mainly of calcium lactate, gr. v, three times daily. Thyroid extract aggravated the nervous symptoms and was withdrawn.

Kendall (*Boston Med. and Surg. Jour.*, October 19, 1916, abstracted in *Jour. Am. Med. Assn.*, November 4, 1916) finds that the entire activity of the thyroid is manifested by the administration of alpha-iodin, a crystalline compound abstracted by the thyroid gland. This substance given alone in very small amounts will supplant thyroid activity, and in excess will cause symptoms simulating exophthalmic goitre. It appears to have no direct action on the pulse-rate. The extent to which the rate is affected depends not on the administration of the thyroid but on the simultaneous ingestion of food, and in particular of amino-acids. This effect may be outlined as follows: After the administration of the compound there is no apparent effect for many hours. There is no increased pulse-rate nor drop in the blood-pressure. However, if the thyroid hormone and amino-acids are injected simultaneously the pulse-rate is enormously affected, and even death will result, due to the apparently great increase in metabolism going on in the animal. It appears very probable that the thyroid hormone manifests its activity by reacting in some way with amino-acids.

In this connection the observations of Cannon (*Boston Med. and Surg. Jour.*, October, 1916, abstracted in *Jour. Am. Med. Assn.*, November 4, 1916) are somewhat illuminating.

To test the effect of overstimulation in a particular region of the sympathetic system, Cannon, about two years ago, fused in the cat the anterior root of the right phrenic nerve with the right cervical sympathetic strand. Thus, after regeneration had occurred, there was delivered to the neurons in the superior cervical ganglion a volley of impulses every time the animal breathed. The operations were performed early in May. In October four of the six animals were still alive. All had peculiar symptoms. There was marked tachycardia. Though fed like normal animals, they had loose movements of the bowels. They were unusually excitable. The basal metabolism was much elevated. In two animals that died of the disease the suprarenals were found much increased in weight. One of the animals had definite exophthalmos and respiratory oscillations of the pupil on the operated side.

Since these first observations the disease has been produced in another animal, and it has been proved that the symptoms—rapid heart, increased excitability, steadily mounting metabolism with loss of weight—all disappear on the removal of the thyroid on the operated side. The metabolism, which had increased approximately 100 per cent., dropped to within normal limits. Whereas the other animals having the induced disease had died within three months of the first appearance of the symptoms, this animal lived normally for seven months after the operation, and was then purposely killed. The thyroid is subject to that division of the nervous system which is brought into action in emotional excitement and which causes suprarenal secretion. Cannon believes that it is probable therefore that the thyroid, like the suprarenal, has, normally, functions which are performed in times of critical emergency, and that such an emergency function is an exaggerated form of the routine activity of the gland.

Very little is known of tetany. It is believed to follow complete removal of the thyroid glands, including the parathyroids. Osler quotes 13 cases which followed 68 operations

on enlarged thyroid in Billroth's clinic, and 6 of them proved fatal. James Stewart has reported an instance in which, with the tetany, there were symptoms of myxedema and no trace of the thyroid. Osler further states that the two features valuable in the diagnosis of tetany are as follows: "The instability of the nerves is enormously increased both during the period of tetany and subsequently. Thus a minimal strength of current necessary to produce contracture during the quiescent period is sufficient during the attack to cause a distinct tetanic contraction. The second point is the so-called Trousseau's phenomenon, namely: Pressure on the larger arteries, sometimes on the nerve trunk, will excite the spasm which continues while the pressure is kept up."

In our particular case there is a history of great difficulty in removing the right lobe and some trouble in removing the left lobe. It is not unreasonable to suppose in the light of the above that the symptoms cited in our patient were due to traumatism of the sympathetic nerves in the neck and their allied branches, causing severe vasomotor changes. The eye-grounds showed the edema of the neuroretinitis along the retinal vessels for some distance, showing a direct relation of the vascular supply. The retina between the vessels and the periphery were clear. If the choked disk were due to toxic action the edema would probably have been more evenly spread about the disk. The trauma was most pronounced on the right side of the neck, and the left eye was most affected. In addition to the ocular symptoms, other conditions which can be explained by intense vasomotor phenomena are the intense perspiration, tetanic contractions, delirium (edema of brain), feeling of intense nervous unrest with no pain, dizziness upon the slightest visual or mental exertion. The sensation of blindness, though the central nerve is practically normal with a broad visual field, can only be a mental phenomenon. An edema of the brain, optic nerves, and retina could explain many of these phenomena. This is rendered more likely by the complete disappearance of the swelling

from the eye, with absence of secondary changes, excepting a gray nerve.

It is seen therefore that violent nervous and ocular symptoms are caused not only by the ingestion of the active principle of the thyroid gland but also by transplanting of nerves in the neck with those of the sympathetic system.

Traumatism in the difficult removal of a thyroid gland would also probably affect the smaller branches of nerves in the neck and those of the sympathetic system, bound up so intimately with the thyroid system. False union could send nerve impulses through the sympathetic system, inducing great derangement of the entire vasomotor system.

RUPTURE OF THE CHOROID

BY WILLIAM H. CHANDLEE, M.D.

ASSISTANT IN THE OPHTHALMIC DEPARTMENT OF THE HOSPITAL

THE object in reporting this case of a not infrequent condition, following a traumatism, is to emphasize the importance of a careful and early examination of the eye and eye-ground, in all cases of injuries in the immediate region of the orbit, and especially those which have been produced in a manner similar to the one about to be described. This is important in order that the proper treatment then be instituted at a time when it is possible to preserve as much of the vision as is practicable, by limiting the destructive processes, caused by inflammatory conditions which follow such injuries.

B. E., male, aged eleven years, white, in good general health, and with a negative family history, both as regards health, and eye conditions.

Previous History. With the exception of the ordinary diseases of childhood, he has always enjoyed good health. When he was four years of age he was injured by the fender of a street car, but no serious results followed, and he was not compelled to go to bed. He had some contusions of the body and head, but none in the region of the eye. There is no history of other injuries until January, 1916.

Following the time of the accident described, there did not appear to be any indication of a disturbance of his vision in either eye, as neither he nor his parents noticed any impairment, and there was no report of any defect from the examining physician of the school.

Present History. In January, 1916, while at play, an air rifle in the hands of a playmate was pointed at him and discharged, at a distance of about fifteen yards, the grain of shot entering just above the lashes of the right eye, then taking an upward course.

He consulted a physician, who sent him to a hospital, where the shot was removed in the usual manner. He received no other form of treatment, that is, no treatment of the eye proper, only for the wound, and no examination was made of the eye or the eye-grounds at that time.

His parents thought no more of the incident until they noticed sometime later that he could not see an object if placed to his right side, out of range of his left eye. Later he was examined by the school physician, who found that the vision of his right eye was impaired, and advised his parents to have him treated as soon as they could do so.

He came under the writer's observation in September, 1916, in Dr. Goldberg's service at the Episcopal Hospital, when his vision was found to be as follows: O. D., 6/60; O. S., 6/6 p.

He had no subjective symptoms, such as headaches or photophobia. The external appearances were normal, with the exception of the small scar about one-half inch in length, where the shot had been removed.

The eye-lids were normal, the tension of the eyeball was undisturbed, the pupils round and equal, and responded promptly to light.

Oblique illumination showed no pathological changes, the cornea was clear and the iris was normal.

The ophthalmoscopic examination showed the media clear, the disk normal. Extending from the nasal side of the disk, nearly to the periphery of the eye-ground, at an axis of 30° , was a rupture of the choroid, about 3 mm. wide, regular in outline and approximately of the same width throughout its entire course. The sclera and fibrous tissue could be seen in the cleft, also the retinal vessels, which had not been injured, and passed over the injured choroid. On the edges of the rupture, deposits of pigment were seen clustered together.

This case differs from the usual ones we see, in being perpendicular to the disk, and in a straight line, while the usual case presents a crescentic shape, and by situation concentric with the outline of the optic disk.

The field of vision is contracted in all meridians, but more especially in the axis affected by the injury, as the chart will show (Fig. 59).

With atropin as a mydriatic he was refracted, the result being as follows: O. D., +1.00 sph. $\ominus$ 0.25 cyl. ax. 90° = 6/50 p. O. S., +1.50 sph. $\ominus$ 0.25 cyl. ax. 90° = 6/6.

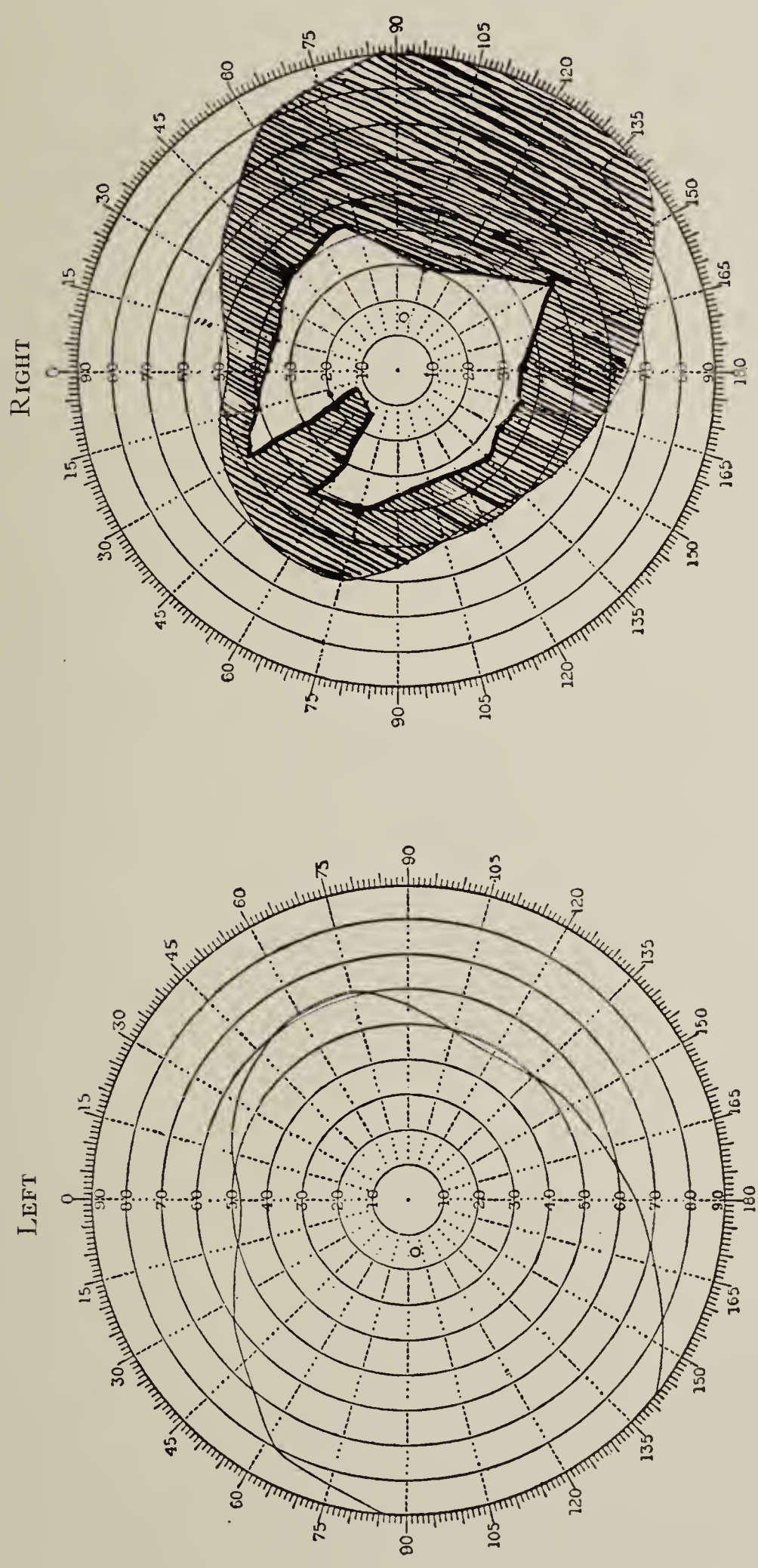


FIG. 59.—Perimeter charts of a patient with rupture of the choroid. The eccentric continuous line indicates the average normal field of indirect vision; the small circle the position of the blind spot.

The vision has been very much reduced by the injury which was not considered of sufficient importance at the time, as to require an examination of the eye, and there was no treatment such as should have been carried out in these cases.

According to Fuchs, "rupture of the choroid is produced through the action of some blunt body upon the eyeball (contusion)." In this case the grain of shot penetrated the soft tissues of the orbit, and upon reaching the more resisting sclera was diverted in its course, but the impact was sufficient to injure the more delicate choroid.

A METHOD FOR THE LIGATION OF THE OPHTHALMIC VEIN FOR EXOPHTHALMOS WITH REPORT OF A CASE

By FREDERICK KRAUSS, M.D.
OPHTHALMIC SURGEON TO THE HOSPITAL

A SATISFACTORY method for the ligation of the ophthalmic vein for the relief of pulsating exophthalmos due to orbital aneurysm or varix has not been described in any literature at our command.

Good effects have been ascribed to the ligation and excision of some of the orbital veins through incisions in the eyelid. When it is remembered that the orbital fat is filled with enormously dilated veins with free anastomosis, the futility of such a procedure is evident.

It occurred to the writer that any deep-seated growth on the inner side of the orbit could readily be removed by separating the periosteum from the orbit from above, displacing the contents of the orbit enclosed within the periosteum. An incision in the periosteum at the desired point would disclose the growth within the orbital fat, from whence it could be removed, or a large vessel tied, etc. The following operation was used very satisfactorily upon a case of pulsating exophthalmos, having a large pulsating vessel deep in the orbit, behind and to the inner side of the eyeball.

After the usual aseptic preparation (the right eye in this case), the eyebrow being shaved, an incision was made down to the periosteum, beginning at a point on a vertical line, extending up from the outer canthus to the upper border of the eyebrow. The incision was carried parallel

with and 5 mm. above the upper border of the eyebrow to the root of the nose, curving along the side of the nose to below the level of the caruncle. Owing to the enormous dilatation of the angular vein there was free bleeding, which was checked with artery clamps. The periosteum was carefully separated until the optic nerve could readily be felt with the finger, also demonstrating a large pulsating mass nearby. A longitudinal slit was made in the periosteum showing the orbital fat to be completely filled with enormously distended veins. A pedicle needle armed with catgut was passed through the incision down, out and backward to enclose the largest mass of pulsating vessels at right angles to its long axis. The catgut was retained double and tied in two sections, making two ligatures with one insertion of the needle. The pulsation ceased. The wound was closed with through and through silkworm gut sutures, including the periosteum.

In future cases I intend to apply other ligatures in order to enclose as much of the venous supply as possible to prevent free collateral circulation and return of the trouble. We were unfortunate in having a stitchhole abscess which delayed the healing, but the patient made a good recovery, delayed by the necessary draining through gauze packing.

The history of the patient operated upon has been reported in full in the third volume of these Reports (1915), p. 250.¹

A brief resumé is given as follows:

Female, aged fifty-nine years, with a negative family history, presented, at her first visit on April 22, 1915, an extremely pronounced right-sided exophthalmos, with a loud bruit heard over the face, but loudest over the anterior portion of the temporal bone. There was no ocular pulsation.

The vision was 5/15 of normal in each eye. The eye-ground showed great fulness of the retinal veins. The Wassermann reaction was negative. Blood-pressure, 215 mm. systolic. There was no history of traumatism. Treatment consisted of iodides, sodium nitrite, rest in bed, with intermittent compression of the common carotid. There was a gradual subsidence for several months, after which the patient complained of a sudden severe

¹ Reprinted from the New York Medical Journal, May 6, 1916.

pain in the right eye, followed by the most intense proptosis of the right eye and very marked exophthalmos in the left eye.

The pulsation in the right eye became very pronounced, but was absent in the left eye. Pressure on the right common carotid caused a disappearance of the bruit, though the exophthalmos was unaltered.

The bruit of the temporal bone, heard subjectively as a loud, continuous blowing noise, became less, but was loud over the eye.

The general condition of the patient contra-indicated the tying of the common carotid. The movements of the right eye were abolished, except slight movement to the nasal side. The pupil was widely dilated, the choroidal vessels and veins enormously enlarged, followed shortly by choroidal and retinal hemorrhages, low grade of iritis, with fine vitreous opacities and blindness. After several months of intermittent compressions of the common carotid artery, blindness remained, with complete palsy of the external and superior recti. A large pulsating vessel could easily be found on the inner side of the eyeball on deep pressure. An attempt was made to tie this vessel by entering the posterior part of the orbit through the upper inner angle. On January 10, 1916, an incision was made directly above the eyebrow, parallel to the same from the outer orbital line to the root of the nose, curving down along the nose to the level of the canthus. The periosteum was separated from the orbit, dislocating the contents of the orbit within its folds. The pulsating vessel being readily felt, an incision was made near it through the periosteum, disclosing enormously distended veins throughout, explaining the exophthalmos. A catgut ligature was passed around the largest and pulsating vessel by means of a pedicle needle and tied. The pulsations ceased.

From further observations I am convinced that more than one strong ligature should be used if a permanent result is desired, as the collateral circulation entered the dilated veins, with a partial return of the symptoms.

The patient made a good recovery, except that part of the wound showed infection five days later. This yielded to antisepsis. The patient was comfortable through absence of subjective noises.

Several weeks later, pulsation returned in the orbit near the upper inner edge, where a small sluggish sinus remained, secreting very little and closing intermittently. The nurses reported saturation of the bandages at intervals with bright red blood, but no one ever saw any bleeding occur. I then made deep massage over the orbit to discover the reason. This caused a tremendous hemorrhage which I immediately controlled by pressure against the bony

orbit. Preparations were made to take the patient to the operating room. As the hemorrhage ceased, and there was no further indication of the return of the hemorrhage, the patient was allowed to be up without any further interference.

During my absence from the city there was spontaneous recurrence of the hemorrhage from the orbit. No one ever saw any bleeding, although the dressings were saturated daily. The common carotid was tied by Dr. Thomas R. Neilson on February 23, 1916, with resulting subsidence of the pulsating vessels and immediate healing of the small sinus.

Conclusions derived from the study of one case are apt to be erroneous. This case has presented unusual conditions and has been observed carefully for a long time. In a case of pulsating exophthalmos in the service of my colleague, Dr. Ring, and transferred temporarily to me during his absence, ligation of the common carotid caused a temporary cure of the exophthalmos with gradual recurrence of the condition. Anything then that promises additional security is worthy of consideration. Our patient is cured.

The vital points of interest are as follows:

1. Apparent aneurysmal varix between the internal carotid and the cavernous sinus, evidenced by the intense exophthalmos of both eyes, worse in the right, and palsy of the internal and external ocular muscles. Pulsation absent from eyeball. Very loud bruit heard all over the face and eye, but most intense over the temporo-frontal articulation. Continuous loud noise heard by the patient, especially in the right ear.

2. Apparent cure of this condition by rest in bed, moderate medication, and intermittent compressions of the common carotid. This was shown by gradual loss of the subjective noises, bruit no longer heard over the temporal bone, subsidence of the exophthalmos, complete in the left and largely in the right eye, with partial return of ocular movements.

3. A relapse causing more intense exophthalmos than ever in the right eye, moderately in the left. Intense chorioidal engorgement, retinal veins full, later chorioidal hemorrhages,

vitreous hemorrhages, low grade of iritis, with dilated pupils (palsy), absolute blindness.

4. Ligation of the ophthalmic vein by a new route (namely, supraorbital and retrobulbar) was successfully performed, with partial cure of the condition.

5. Recurrence of collateral circulation in the dilated veins of the orbit caused a pulsation in a new area. The weak walls of the veins no longer retained by the dense periosteum gave way at times, allowing a free gush of blood through a small sinus in the upper inner angle of the orbit.

6. Frequent bleedings caused a fall of the blood-pressure to normal. The common carotid was tied without any further complications. Gradual subsidence of the exophthalmos followed.

The patient's general health has been greatly benefited by her prolonged treatment and stay in the hospital. When she was discharged the condition was as follows:

The right eye showed marked ectropion of the lower lid. The eyeball is in practically normal position, with good muscle movement. The cornea is faintly nebulous below. The pupil is widely dilated and immobile. There is a fine haze of the vitreous, preventing a view of the fundus. The left eye is normal, except that the nerve shows slight atrophy.

The exophthalmos was found to be due to the enormous engorgement of veins in the orbital fat.

I am inclined to think that tying of the ophthalmic vein is in itself insufficient in a severe type of aneurysm of the orbit, on account of the return of collateral circulation. I believe that if the angiomatous mass was tied off in various directions with heavy ligatures a permanent success should be obtained. One ligature is insufficient for a permanent cure.

At the present writing, November 3, 1916, the scar resulting from the operation is barely perceptible, being hidden above by the eyebrow and on a line with the curve of the nose. The right eye, as a matter of course, remained blind, while the left eye shows moderate optic atrophy, with 5/x vision and cut fields.

ULTIMATE RESULT OF THE REMOVAL OF A FOREIGN BODY FROM THE VITREOUS

By SAMUEL HORTON BROWN, M.D.
ASSISTANT IN THE OPHTHALMIC DEPARTMENT OF THE HOSPITAL

THE case which provides the basis of this report occurred in the person of a young male engineer while engaged in chipping a gear. A fragment of the gear or the chisel, most likely the latter, was broken off and flew up with considerable force, striking the patient's eye and penetrating it. After being deflected by contact with the margin of the lens it passed through the vitreous and lodged in the sclera, well back, down and toward the nasal side. It was located by the x-ray and subsequently removed in the course of a magnet operation, although the magnet was not primarily the instrument that effected its removal.

The history of the case in detail is quite interesting. The patient (I. R., card No. 511, series 1916, eye dispensary) was a man, aged twenty-six years, American by birth, employed as an engineer by the Eastern Paving Company at Third and Luzerne Streets, Philadelphia, where he had been working for three months. At about three o'clock in the afternoon of August 9, 1916, while still at work, chipping a gear, without wearing protective goggles, a fragment of steel from either the gear or the chisel struck him in the eye. Within an hour after the accident he was seen by the writer.

Examination at that time showed a perforated wound of the right eyeball on the nasal side, at the sclerocorneal junction, in a situation usually designated as between three and four o'clock. The iris was not only ruptured from its basal attachment, but was lacerated as well, and in consequence the anterior chamber was filled with

CHART FOR DR. SWEET'S IMPROVED EYE LOCALIZER.

Made by Roentgen Manufacturing Co.

Surgeon J. H. Brown

Patient Bruce Rhoads

Date 8/10/1916

No. 7760 B

Scale Full Size In m.m.

Size of body by by m.m.

RIGHT

FRONT VIEW

LEFT

SIDE VIEW

SIDE VIEW

RIGHT

LEFT

HORIZONTAL SECTION

Location of body in Right eye

End	Back of Centre of Cornea	Horizontal Plane above	Horizontal Plane below	Vertical Plane temporal side	Vertical Plane nasal side
Front	15 mm.		12		12 mm.
Rear	16 mm.		8		10 mm.

Remarks—

March 9, 1909.

FIG. 60.—Diagram showing localization of a foreign body in the vitreous.

blood, obscuring any view of the fundus. The eyeball was irritable and painful, and especially tender in the ciliary region. The vision consisted of light perception in the right eye and 5/15 in the left eye. It was impossible to see or to palpate any foreign body in or about the eye. The patient could give no history that would lead us to believe that the foreign body emerged or was reflected from the globe, and it was considered wise to admit him to the hospital for detailed examination and treatment, the eye being so tender and irritable. Atropin was instilled and the eye bandaged.

Clinical examination in the hospital the following morning showed an increase in the vision. The patient was able to read with the injured eye. The tension was normal and the lens was cloudy down and in. Tenderness was still present.

X-ray examination using the Sweet localizer demonstrated the presence of a foreign body in the right eye in the situation shown in the accompanying diagram (Fig. 60). It will be noted that the foreign body appears to be lodged in the sclera, one end within and the other end without the globe.

Later this same day (August 10, 1916) the patient was etherized and, contrary to the usual custom of incising the globe on the outer side in cases of this character and drawing the foreign body across the vitreous by the magnet, the conjunctiva was incised between the borders of the inferior rectus and inferior oblique. The globe was carefully palpated for any superficial foreign body. A long incision was made in the sclera, beginning 3 mm. from the corneal limbus, extending backward parallel and close to the inferior border of the internal rectus. The Sweet hand electromagnet was introduced and the current turned on, but with no effect on the foreign body. It was introduced two or three times, with the same result. In the course of the manipulations a hard substance was felt, movable, in the tissues covering the globe, deep in the inner portion of the orbit. Ténon's capsule was then opened and a fragment of steel (6 mm. x 2 mm.) was removed by means of fixation forceps. The wounds in the sclera, Ténon's capsule, and conjunctiva respectively were sutured; atropin was instilled and the eye bandaged.

There was little or no reaction following the operation. The lens opacity cleared somewhat, but the iris showed some of the pigmentation characteristic of iron and steel injuries. The patient meanwhile was also the subject of acute gonorrhea, but there were no ocular manifestations or complications of the disease.

The immediate result showed retention of the globe, with vision

reduced to light perception. The eye was perfectly quiet when the patient was discharged.

The patient passed without our immediate observation, and was seen by two physicians in Philadelphia and one in Harrisburg, one of whom advised immediate enucleation. The patient stated at no time was there any pain or tenderness in either eye. Three months later he was observed by us and gave a history of having had absolutely no symptoms since leaving the hospital. Careful inquiry into the possibility of pain, tenderness, redness, or photophobia elicited negative replies. He had consulted these physicians previously mentioned as a precautionary measure. He had been out of the city, and on his return he was working, so that he could not by force of circumstances reach the hospital.

Examination at this time (three months after operation) showed the right eye absolutely quiet. The anterior chamber was very shallow, almost effaced and the tension low. The pupil was rather large and irregularly oval, with a portion of the radial fibers drawn over toward the site of the original wound. The lens was dislocated, or rather rotated on its vertical axis, impinging nasally on the posterior surface of the ciliary region. The lens was full of opacities but was not completely cataractous. The fundus reflex was good in almost the entire fundus, but there was no detail obtainable. A small detachment of the retina down and in was demonstrated by the greenish-white scleral reflex corresponding to the area of injury and scleral incision. There was no contraction of the sclera at the site of incision; the iris was normal in color. The vision in the right eye was 2/60 throughout most of the field. The left eye had vision of 5/6, and was entirely quiet.

In analyzing the several important features of this case, we are first impressed with the slight degree of reaction and ultimate damage to the eye. The passage of such a large foreign substance through the globe within the ciliary zone and its passage out through the sclera is usually accompanied by considerable immediate reaction in the injured eye, and remotely by sympathetic disease in the other eye. The additional traumatism produced by incising the sclera and introducing an electromagnet and the attendant manipulation would be productive of considerable damage and reaction even in an eye not otherwise injured. Despite the fact

of the presence of urethral gonorrhea there was no reaction. The patient's entire sojourn in the hospital covered but seventeen days.

The peculiar behavior of the splinter of metal is entitled to passing comment. After its passage through the tough and resisting corneoscleral junction, the margin of the crystalline lens was sufficient to deflect it so that it curved down and in, penetrating the sclera in the situation shown in the diagram, but its force was so far spent that it lodged in the sclera with each end protruding. The luxation of the lens on its vertical axis was probably first preceded by luxation of the nasal margin down and back. The suspensory ligament now being ruptured the lens fell back into the least resisting part of the globe forward and in, the consistency of the vitreous being unaltered by the original accident or its treatment prevented it from remaining in the more posterior position.

There was no hemorrhage into the vitreous as far as we are able to determine. Vision cleared up within twenty-four hours after the accident, and as late as three months after operation the fundus reflex was good in all but a small part of the nasal portion of the fundus. Details of the fundus were obscured by the opacities in the lens, we believe, and not by any in the vitreous.

The retention of gross vision, $2/60$, was very gratifying, especially in view of the scope of the injury and the damage and manipulation incident to the extraction of the foreign body. The possibility of sympathetic disease is not eliminated, but the course of this particular case furnishes a plea for the consideration of cases of this character individually and not in groups, since a certain number so considered will be attended by results similar, often greater, to those obtained in this instance.

MIRROR WRITING: CLINICAL REPORT OF A CASE ILLUSTRATING THE ULTIMATE RESULT¹

By SAMUEL HORTON BROWN, M.D.

ASSISTANT IN THE OPHTHALMIC DEPARTMENT OF THE HOSPITAL

A RECENT paper by F. P. Calhoun (*Ophthalmic Record*, September, 1915), of Atlanta, Georgia, carefully reviews the literature of this novel condition, and relates the history of a seven-year-old boy, normal in every respect, except for some adenoid tissue in the nasopharynx, and a slight amount of hyperopia, who presented this curious way of expressing himself in writing. He was able to read his reversed writing. He, also, had learned to write in the orthodox manner with his left hand. Ultimately he acquired the ability to write as other people, with the right hand.

The case that I wish to add to the literature of this subject, has to do with a colored boy, aged about ten years, who was placed in a class of boys in school of about the same age, and who was considered a dullard, until a painstaking teacher discovered that his work, when it was learned how to interpret it, was of fair average. Unfortunately, it was quite a while before the teacher discovered this peculiarity of expression. Through the courtesy of one of his teachers, Miss Martha W. Lanning, of Bridgeton, N. J., I am able to present evidence of his work extending over a period of three years.

It will be noted in the serial exercises, that is to say where the exercise is copied from the board and then repeated several times on the paper, that they are exactly the same. The

¹ Reprinted from *Ophthalmology*, April, 1916.

phenomenon known as physiologic rhythm has been brought into action. It is interesting to speculate as to the character of the writing had the subject paused for a definite interval, read his work, and then proceeded to copy it, but in none of these exercises do we find anything to suggest that this has occurred. In the later exercises he shows a tendency to part with the old style reluctantly, as is evidenced by the date.

An attempt to elaborate upon the bibliography furnished by Doctor Calhoun has met with no encouragement, since that writer has included everything of value, even to this date.

The interesting feature of a case of this character is not the occurrence of the anomaly and its subsequent involution, or evolution, depending upon how it is looked upon, but the fact that a teacher would recognize the condition and thereby aid the youngster to keep fairly abreast with his fellows until the proper development had taken place. The saving to the Public School Department, and subsequently to the community by this little thought by the teacher is enormous. The course of the condition extended over about three years from the time it was first recognized. This is the average duration. But this case occurred in the person of a poor boy, in a small city, and had not the forces back of him to take care of him that a white boy of the not-quite-so-poor class would have.

With great difficulty, as it was, to take the time to make allowance for his deficiencies, he did not progress, as classes go, and he was compelled to stay two years in the first grade, and two years in the second grade, but it was thought advisable to promote him to the third grade, and immediately improved in every way.

2	8	9	7	5	2	8	9	7	5
9	4	7	7	7	9	4	7	7	7
11	12	16	14	12	11	12	16	14	12

Exercise of November 30, 1912, as it appeared on the black-board.

The same exercise as it appeared when copied by the pupil several times.

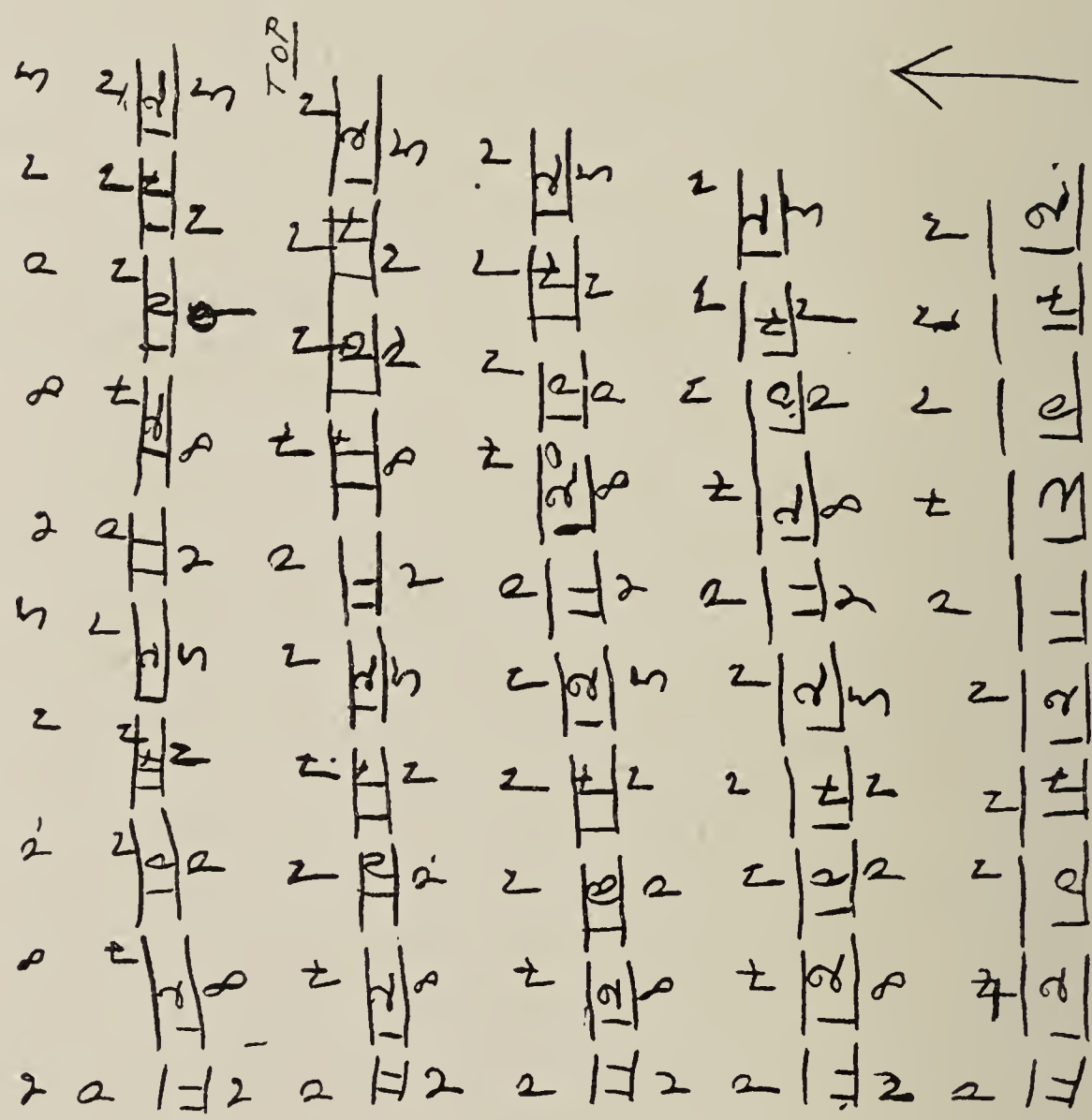


FIG. 61

The exercise as it appeared on the blackboard.

3	1	3	2	2	3
2	2	2	2	3	2
1	3	2	3	2	3
6	6	7	7	7	8
3	3	3	4	3	3
3	3	4	1	1	2
2	3	1	3	4	4
8	9	8	8	8	9

The exercise as it appeared when copied by the pupil in 1914.

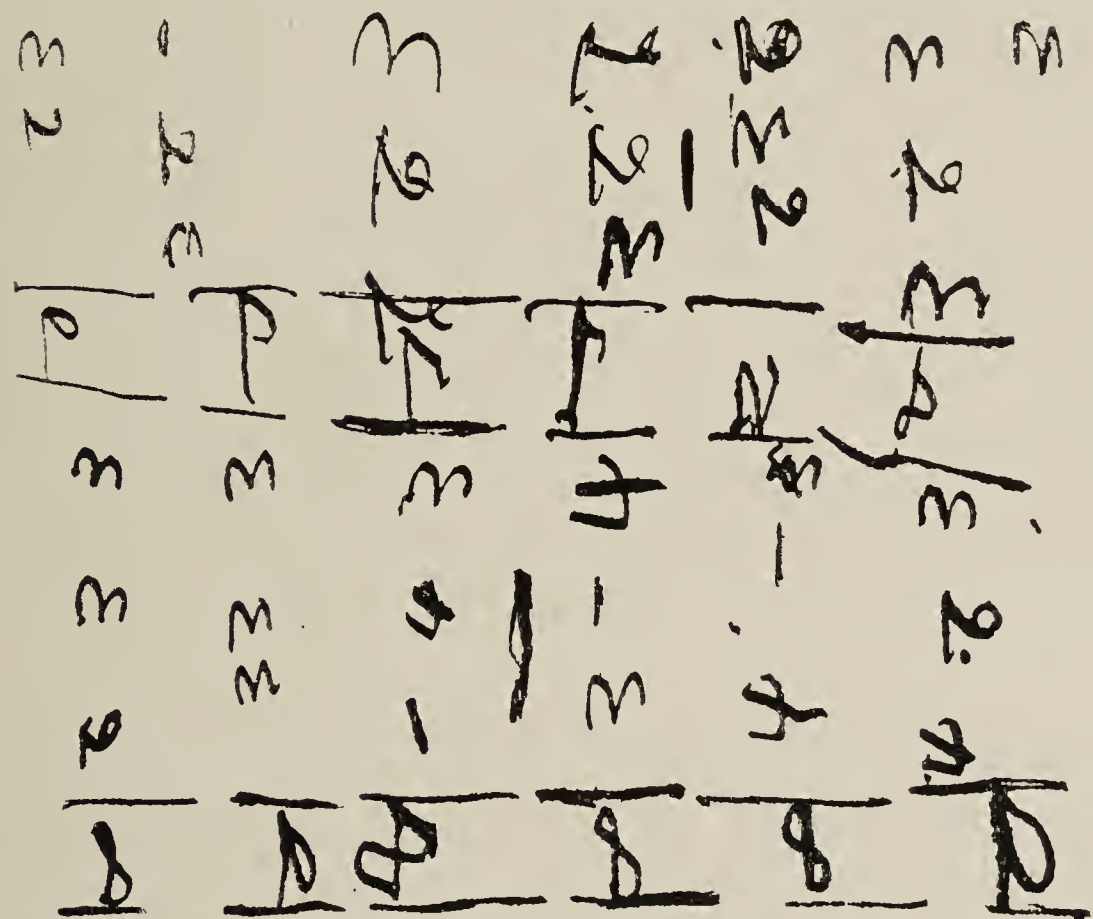


FIG. 62

The exercise of Wednesday, October 8, 1913, consisting of writing the letter *q*, appeared with the date as follows:

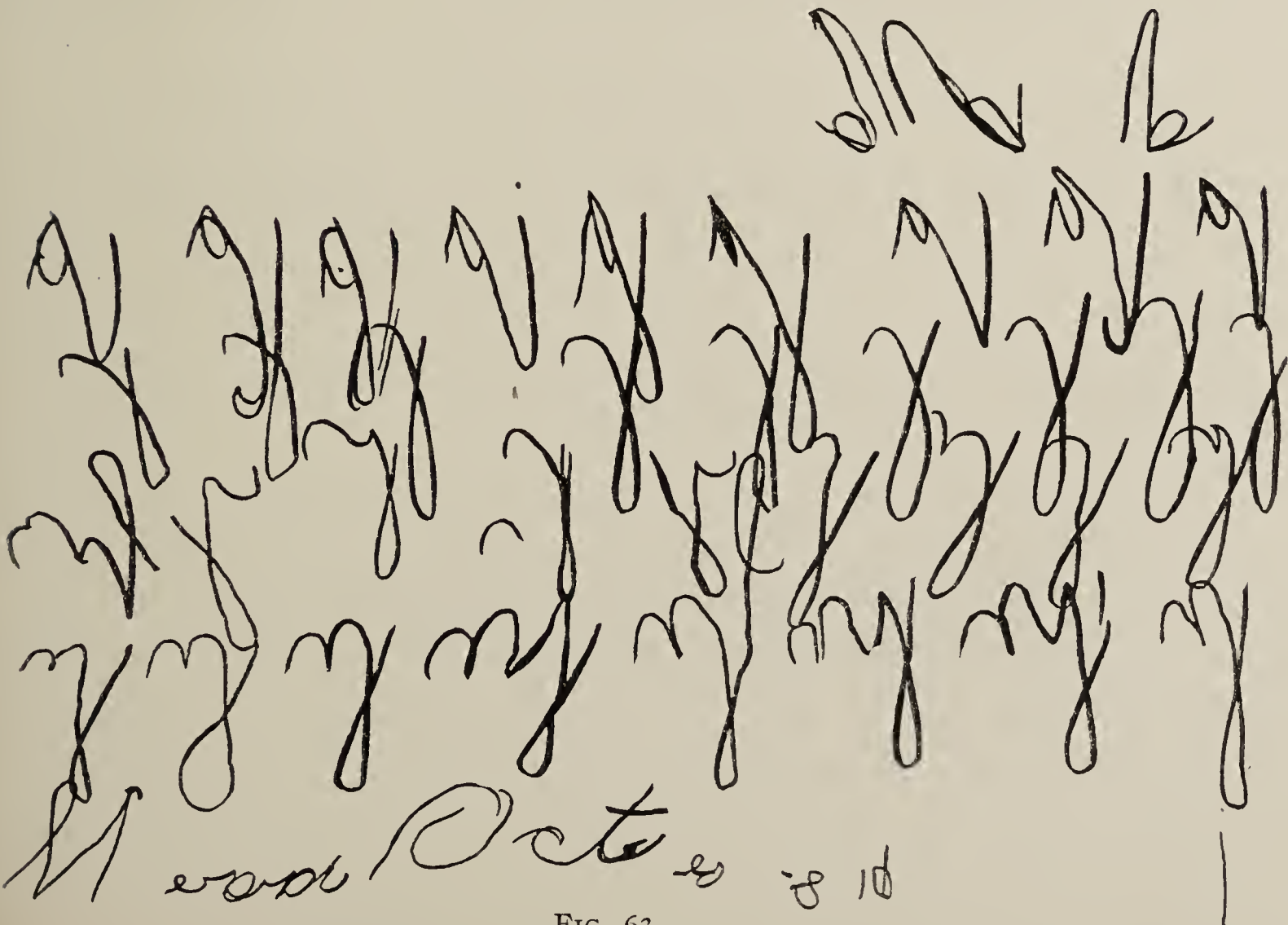


FIG. 63

H. Goldsborough *Oct 14, 1915*
Statements.
 To-day is Thursday.
 I think it will rain.
 I like to walk in the rain.
 It will be dark soon.
 The sun will go to bed.

FIG. 64.—Exercise of October 14, 1915

In October, 1915, we find that the visual interpretation permits of work of this character:

H. Goldsborough *Arithmetic* *Oct 14, 1915*

7960	2937	3420
~~384~~	~~7804~~	~~146~~
4484	7033	2016
2473	7546	
~~1043~~	~~3528~~	
1430	4026	

FIG. 65

Exercise copied from the blackboard in October, 1915.

NOTE THE CHARACTER OF THE DATE.

English.

I broad I attend I attend I attend I attend	Vine St. Vine St. Vine St. Vine St.	Longwell. No school I school I school I school
---	--	--

FIG. 66

This patient has always written with his right hand, although he has some of the habits of the left handed child, such as writing apparently from above the line, and pointing

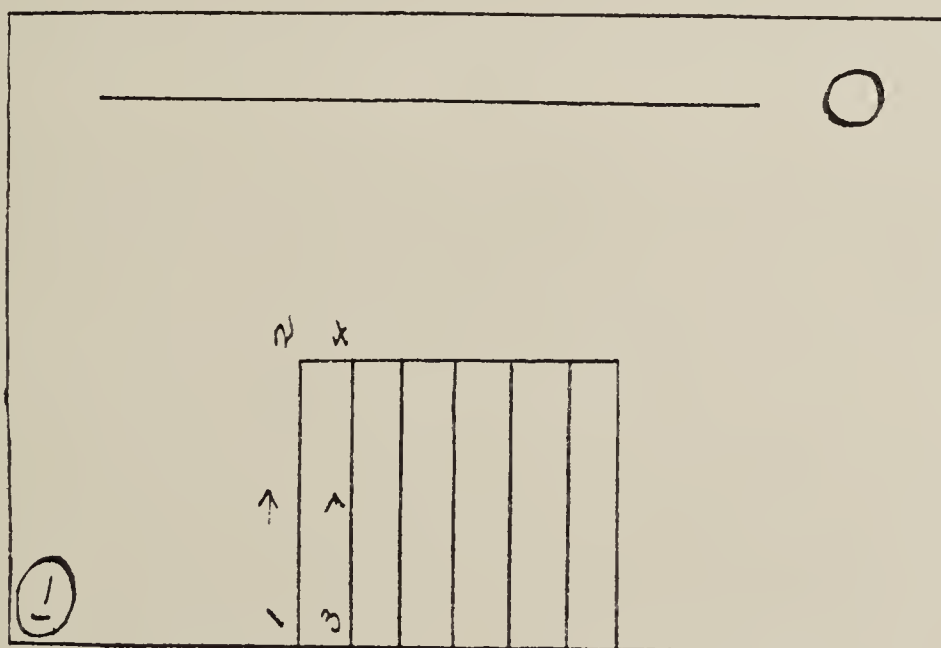


FIG. 67.—Position of patient at school desk, with direction of writing indicated by arrows.

the pencil toward himself. In the upper diagram is shown the manner in which he places the paper, and the direction which his writing takes, from below up. In the lower diagram is shown the manner required of the pupils in that school.

The medical inspector has recorded this boy's vision as normal in each eye, and there is no strabismus. His brothers while slow in their school work show no similar peculiarities.

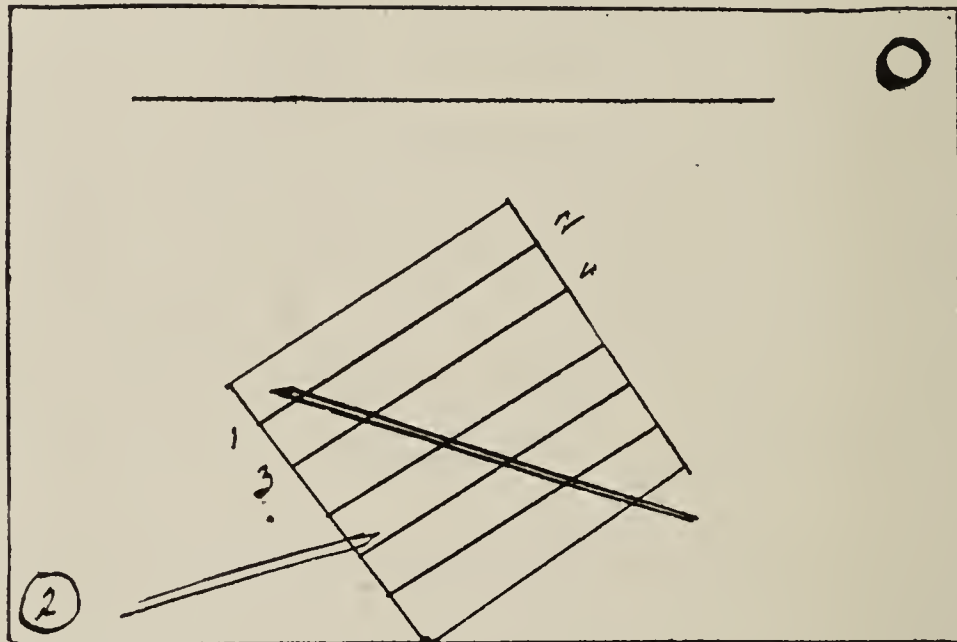


FIG. 68.—Showing the position of the paper on the desk, as directed by the system of instruction in this particular school. The upper pencil is held in the normal manner; the lower pencil is held in the same manner as the patient holds his.

He would invert everything taken from the board, but would read correctly from his own transposition. His age is now ten years.

REPORT OF DENTAL AND ORAL SURGICAL DEPARTMENT

By JAMES R. CAMERON, D.D.S.

DENTAL SURGEON TO THE HOSPITAL

AND

HAROLD T. FAGGART, D.D.S.

RESIDENT DENTAL SURGEON IN THE HOSPITAL

THIS department of the Episcopal Hospital is nearing the completion of its third year of existence, and we feel that the hospital has been benefited by having such a department. The first two years were experimental, there being little or no definite system.

In the last report to this volume it was recommended that a visiting dental surgeon be appointed. This has now been done, and today the dental service of the hospital is systematized and offers to the young dental graduate a wonderful opportunity for experience.

With the awakening of the medical and dental men to a fuller appreciation of the important role that oral infection can play in systemic disorders, comes the appreciation of dental service in our hospitals. We venture to say that the next few years will see all hospitals claiming the title of "modern institution" equipped with a dental outfit in working order. To obtain the best results and derive the greatest benefit from such service, we feel that the establishing of the dental work on the same platform as the other specialties will attain the desired result. There are many hospitals experimenting with dental work, inasmuch as they have a practi-

tioner devote a few hours a week, or the like, to caring for the dental cases. This plan is not productive of the best results, and it would be better for institutions to have a regular service, one that would be permanent and could be relied on. To do this means, as it has in the past when new specialties were created, the transferring of certain cases from the established service to the newer one. This, of course, means the depriving of some service of certain cases, yet it is only in keeping with the modern idea of specialization.

Never before in the history of medicine or dentistry has there been the closeness of feeling and endeavors for mutual work that are seen at the present time. Dentists, as a class, are today taking up in earnest the study of their problems more from the pathological side than from the mechanical aspect, which has been customary in the past.

With the training of the young dental graduate in hospital service will come the better appreciation of this part of the profession, and the public will be the richer for the opportunities thus afforded.

What a broad field there is for the properly trained dental surgeon to combat malignant growths of the oral cavity and jaws. There are more people who present themselves to the dentist for examination than there are to the physician, hence the importance of a dentist having a knowledge at his command to recognize any suspicious growth. The average patient goes to the physician only when ill, but in dental practice patients have been taught the value of periodical examination whether they have symptoms of trouble or not.

Along the lines of preventive medicine dentistry has made rapid strides, and continues to do so. The question uppermost in the minds of the dental profession today is that of peri-apical infection and its relationship to systemic disease. The frequency of filthy septic mouths in hospital cases, and even in the aristocrats of private practice, without obvious ill effects, is probably one of the reasons why so many practitioners deny that mouth sepsis causes constitutional disease.

Dentists and physicians observing that pus may be discharged from a sinus in the mouth for months without producing manifest symptoms, erroneously conclude that oral sepsis rarely causes constitutional disorder, forgetting that drainage lessens this probability and that absence of symptoms does not prove the absence of disease. Certain of these patients may have acquired an immunity, while in others early pathological changes already exist that are recognizable with difficulty, if at all.

Serious consideration of the evidence furnished by clinicians, pathologists, and bacteriologists, including animal experimentation, during the past few years, cannot fail to convince or at least impress the most skeptical that even small septic foci in the mouth are capable of producing not only serious but sometimes fatal diseases of vital organs. The virulence of the streptococcus is more important than the size of the lesion. One of the most common and least recognized constitutional effects of mouth sepsis is the more or less well-marked malaise, or feeling of great fatigue, due to the toxic substances produced by pyogenic organisms. That this condition is true is clinically evidenced by the prompt disappearance of this distressing symptom when the focal cause has been removed. When this condition exists unrecognized for a lengthy period, it is apt to be explained as due to excessive work, or as the result of stress or strain of the nervous system.

RELATION OF THE TEETH TO THE BODY. The relation which exists between the teeth and the rest of the body is most striking at this time. We believe that every child prior to an adenectomy or tonsillectomy should have the mouth put in as cleanly a condition as is possible. This procedure if followed out would probably do away with many sore throats which frequently follow tonsil and adenoid operations. We likewise believe that all cases for operation, whenever possible, especially abdominal cases, should have the attention of the dentist prior to being taken to the operating-room. It

seems at times almost incredible that a physician can ever expect to produce results in an already impaired constitution with a mouth that is nothing less than a cesspool of infection. For this reason and the ever-increasing demand for dental treatment on the wards we feel that the equipping of a dental-room in the hospital building itself would be of the greatest value to the patients on the wards. It is not always possible, and often most inconvenient, to have to transfer a patient from the wards to the dental-room in the dispensary building. A dental-room in the hospital itself would make it possible to accomplish a greater amount of prophylactic work, and thereby render to the physician or surgeon a most valuable aid.

REPORT OF CASES FROM JANUARY TO DECEMBER, 1916, INCLUSIVE

Number of patients treated, including return visits	1644
Extractions	2068
Permanent fillings	374
Gutta-percha fillings inserted	528
Dentures inserted	5
Treatments	829
Examinations	125
Referred cases, other dispensaries	62
Oral Surgical Dressings	202
Prophylaxis	37
Fractured jaws	19
Visits made in house (requests from chiefs)	231
Administration of N_2O_2	542
Administration of ether	30
Novocain injections	28

CASE I.—Necrosis of Palate. Mattie I., aged twenty-three years, admitted October 24, 1916, discharged October 31, 1916. Recovered.

Present Illness. Pains in the right side of jaw, and pus flowing at times from the alveolar socket of second bicuspid, causing a very disagreeable taste. The patient states that in 1915 she had the upper second bicuspid extracted, and about four months afterward the jaw began to swell, with false ankylosis of the jaw, gradually disappearing, but a small sinus still remained in the socket of the second bicuspid tooth, from which pus would flow at times (Fig. 69). The nose seemed to be drawn toward the right side, and slight swelling on the right side of the palate.

October 25. *Operation* (Dr. Cameron). Incision in the palate just distal to the premaxillary suture longitudinal to the palate and extending into the socket of the first bicuspid. The periosteum is then dissected back. Necrotic area exposed and curetted. Embedded bicuspid root extracted, wound irrigated with normal salt solution and flap then sutured with catgut, leaving drainage through tooth socket.

October 31. Discharged in good condition, and referred to the Dental Dispensary for further treatment.

CASE 2.—Robert B., aged ten years. Necrosis of mandible. Admitted November 13, 1916.

Chief Complaint. Right side of jaw is swollen, slightly, and pus is flowing from the sinus where abscess has broken. Began about October 1, 1916. Face was swollen for two weeks and was somewhat painful on the right side, near the region of the first molar tooth. The swelling disappeared in two weeks. A tit-like projection is now present on the side of the face with a small sinus, from which pus flows at times.

November 15. *Operation.* A two-inch incision was made along the border of the mandible, just below the sinus. Mandible exposed; necrotic area curetted. Granulation tissue around sinus trimmed away and edges made to approximate; wound partially closed and iodoform gauze drainage used.

Made an uneventful recovery. Wound healing nicely.

CASE 3.—Jennie M., aged fifty-four years. Provisional diagnosis: Tumor of Jaw. Admitted August 31, 1916, discharged September 19, 1916.

Family History. Negative.

Personal History. Always been healthy; had several dento-alveolar abscesses.

Present Illness: Chief Complaint. Pain in the cheek, which was first noticed about March, 1916. Disappeared after one month's duration and then reappeared. Had several lower teeth on the left side extracted in hopes of obtaining relief. Patient states that since the extraction of the teeth the jaws swelled and the pain grew worse. Sought advice from several doctors and dentists without relief. Coincident with the appearance of the swelling of the left cheek the jaws became ankylosed. On May 24, 1916, patient was admitted to this hospital with a diagnosis of obstruction of Steno's duct. The duct was opened and drained. After the operation the patient improved and the false ankylosis

disappeared, and the swelling went away entirely and she was relieved of pain, and was then discharged from the hospital. The patient states that a little puffiness still remained, and in a month or more this passed away without any trouble at all. About the last week in July the swelling began to be noticed again, the swelling being more pronounced than ever before, with a slight amount of pain and false ankylosis.

Left side of face considerably swollen and hard like mass apparently in the cheek. Jaws can only be opened about half inch when the patient makes a great effort. Continual pain present. When looking the patient directly in the face, she appears to have "a chew" of tobacco in her mouth—at least the swelling gives one that impression. With the forefinger in the mouth and thumb on the outside of the cheek, one is able to define the borders of the mass.

September 6, 1916. *Operation.* Three and a half-inch incision along the mandible, from the facial notch to the mental foramen; superficial fascia and muscles are cut through; facial artery then cut and ligated. Tumor mass exposed. Dissection digital and blunt; Steno's duct ligated, Masseter muscle cut through and tumor mass cut away with scissors from the periosteum. During the removal of the mass from the periosteum there was a leakage of pus of a light grayish color from the under surface of the growth. The wound is then irrigated with warm saline solution and touched up with tincture of iodine, iodoform drainage. The wound is then partially closed with catgut suture and dressings applied.

After operation the patient made a good recovery. No infection taking place and wound healing nicely. The pus found at time of operation was sterile.

When seen some two or three months after operation the patient had not had any recurrence, and was feeling in good health.

CASE 4.—Impacted molars, with metastatic arthritis, relieved by extraction. Mrs. B., aged twenty-eight years, admitted August 8; discharged August 13, 1916.

Family History. Father died of pneumonia, mother is living and is suffering from nervous trouble. Two brothers living and healthy, and one sister living and suffering from nervous trouble.

Personal History. Patient has had measles, whooping-cough, mumps, chicken-pox and tonsillitis. Has always been in a pretty good condition. Has always lived in U. S. A.

Present Illness. Slight pain in both sides of the face and jaws and somewhat swollen on both sides, but more so on the left side,



FIG. 69.—Case I. Necrosis of palate.



FIG. 70.—Case IV. Impacted molar tooth; arrows point to periapical infection.



FIG. 71.—Case V. Tooth in maxillary antrum.

extending down the neck and there is false ankylosis of the jaws. The left ankle and knee are swollen and painful, and patient is hardly able to stand on her feet. Patient states that this began about two years ago and has been troubling her off and on ever since, with pain, swelling and false ankylosis, but this gradually goes away and recurs again, generally coming on about menstrual period. States that this is caused by three impacted teeth and infection from same.

August 9. *Operation.* Incision made in dense fibrous gum tissue and extraction of two lower impacted molars and also extraction of the upper left third molar.

August 12. Condition is good.

August 13. Discharged in good condition.

Several months have now elapsed and the patient has not suffered a relapse of her arthritic condition, nor any pains in the face or head, as she did formerly.

CASE 5.—Tooth in maxillary sinus for twenty-four years.

Patient, female, age about sixty years, came to the dispensary with a sore palate prohibiting her from wearing her upper denture. No visible teeth in either upper or lower jaw.

On examination a small sinus was found on palatal side of alveolar ridge, discharging pus on pressure—surrounding area somewhat tender. X-ray was taken and disclosed a molar tooth in antrum (Fig. 71). Patient stated that she had had all of her teeth extracted twenty-four years ago. She was advised to have it removed and consented to have it done, but failed to appear in the hospital at the appointed time.

CASE 6.—Impacted molar and peri-apical infection causing pain at base of brain and across forehead.

Patient, aged fifty years. For two years has suffered severe pain throughout his head, but never directly associated with his teeth. Has lost weight and all ambition for his work. Attributed his trouble to his eyes.

His oculist had radiographs taken of his head and jaws. The jaws revealed an interesting condition. Several peri-apical infections and an unerupted molar lying impacted (Fig. 70).

That these teeth infected as they were and the lower third molar impacted could cause his trouble was a very hard thing for the patient to comprehend, as he stated they had never troubled him to his knowledge. He finally consented to operation and the impacted tooth was removed also the teeth that were infected.

His recovery was slow—but after leaving the hospital has gradually gained weight and almost free of pains in the head.

CASE 7.—Helen S., aged four and a half years. Provisional diagnosis, alveolar abscess. Revised diagnosis, acute osteomyelitis of jaw. Death.

Family History. Father living and healthy. Mother living and healthy. One sister and one brother living and healthy.

Personal History. Has had measles, whooping cough, diphtheria. Never had tonsillitis, scarlet fever, chicken-pox. General health has always been good.

History of Present Illness. Chief Complaint. Face swollen and painful on right side, unable to sleep or rest at night.

Began to give trouble Monday, November 11. Complained of toothache, and sent for Dr. Gorman on Tuesday afternoon, and he advised mother to take child to dentist. The dentist extracted the tooth that seemed to be giving trouble, the lower first deciduous molar. The jaw was still swollen and painful after the extraction and seemed to grow worse, and on Tuesday Dr. Gorman was again called in and advised mother to again go to see dentist; this she did without relief, and came to the hospital on Friday evening, November 15, 1916. Face was swollen and very painful on right side. The child was fretful, and had a temperature of 104.4° F.

On Saturday evening, November 16, the child ran a temperature of 107.4° F. The face on right side in region of submaxillary triangle was markedly swollen, and there appeared to be fluctuation present. This area was incised and an attempt to locate pus was made, without success. A drainage tube was inserted and flaxseed poultices applied every forty-five minutes over the drainage tube, in the hope of establishing a flow of pus.

Child passed a most uncomfortable night continually asking for water. Sunday the condition was somewhat better with a temperature of 102° F. Still no pus draining.

Monday the child began to get worse and in the late evening a peritonsillar abscess was suspected.

Dr. Eves was asked to see the patient but on examination found that the tonsil was not affected.

Tuesday patient somewhat better but quite sick. Radiographs were taken, but did not show anything very clearly.

Wednesday, November 20, the temperature again jumped to 107.4° and the patient seemed to be most toxic. Immediate operation was decided on and done. Both sides of jaw were freely exposed and external alveolar plate opened for a couple of inches. The cancellated tissue was found to contain a light gray pus, the whole condition simulating osteomyelitis. Drainage inserted and warm saline solution kept over wound continuously. Patient did not make a good recovery, and died that evening.

REMOVAL OF FOREIGN BODIES BY DIRECT BRONCHOSCOPY AND ESOPHAGOSCOPY

BY CURTIS C. EVES, M.D.

AURIST AND LARYNGOLOGIST TO THE HOSPITAL

WHEN we know, as stated by Dr. Chevalier Jackson,¹ that "Ninety-eight per cent. of the cases of the bronchoscopically removed foreign bodies are complete recoveries," and that over 50 per cent. of the cases in which the attempt is made by opening the lung are fatal, there is no argument except in favor of the direct methods. One cannot find a more striking example of the improvement in surgical methods than to compare the pushing of a blind old probang down the esophagus for the dislodgment of a foreign body, no matter how pointed or sharp it may be, with the introduction of a well-lighted distal-end esophagoscope guided by the sight of a well-trained eye. More ridiculous still is the passing of forceps between the vocal chords or into a tracheal wound, with the hopes that they will come in contact with the foreign body.

Absurd as it seems, these blind methods are still being practised by some otherwise good surgeons. In this day of surgical enlightenment such procedures can best be expressed by transposing a familiar saying to read, "The blind pushing the blind."

The greatest difficulty for most of us is to get sufficient practise to become skilful. Practise upon the cadaver, and especially upon the body of a child with a long neck, fits one fairly well. The mannikin, while better than nothing, is a

poor substitute except to train one's perspective vision and to afford a fairly good means for studying the mechanical problems connected with the removal of various forms of foreign bodies. The mechanical manipulation necessary for the removal of some foreign bodies requires a great deal of ingenuity.

Jackson² gives some splendid methods for the removal of various forms of foreign bodies. Each foreign body, however, presents new and interesting problems which the operator must work out at the time.

Jackson says³ that "No one should think of attempting for the first time to remove a foreign body from the human being until he has at least one hundred times removed a foreign body from a dog."

Anesthesia. My experience has been so meager in this line of work that I should not attempt to discuss anesthetics. Out of 20 cases I have only done 3 without anesthesia, 4 with cocaine, and the remainder under ether. So much depends upon the temperament of the patient, the assistants one has, and upon one's own skill that I think it is safe to advise ether for at least the first few cases attempted upon the living; especially in esophageal cases where a sharp or pointed foreign body is suspected is it necessary and important to have complete relaxation.

When a patient is in bad condition, due either to previous attempts at removal of a foreign body or to nervous exhaustion, or from any cause other than the presence of the foreign body *per se*, I have found it always best to give the patient two or three days' rest, with careful nursing, before attempting bronchoscopy or esophagoscopy.

Careful inspection should be made of the instruments each time before they are used. A poorly working forceps or a badly lighted tube may be the cause of failure. Forceps can often be set at a convenient angle by consulting the x-ray plates of both anteroposterior and lateral views. It is often advantageous to measure the depth of the foreign body from



FIG. 72.—Case I. Brass-headed tack in right inferior lobe bronchus.



FIG. 73.—Case II. Open safety pin in the hypopharynx.



FIG. 74.—Case I.



FIG. 75.—Case II.



FIG. 76.—Case III.



FIG. 77.—Case V.



FIG. 78.—Case IV.

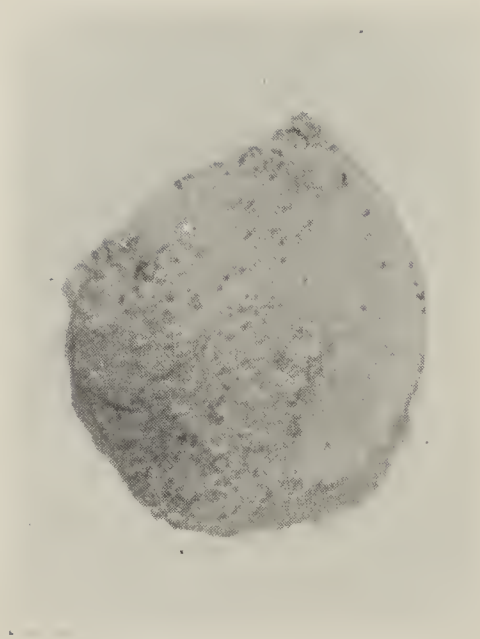


FIG. 79.—Case VII.



FIG. 80.—Case VIII.

the upper teeth after the patient's head is in position, and to mark it upon the instruments.

Only upon the most urgent cases (which are very rare) should bronchoscopy and esophagoscopy be performed for the removal of foreign bodies before obtaining an intelligent history of the case, good *x*-ray plates, and a report of the physical examination of the chest. Two points are of special interest in the history: (1) as to the nature, size, and shape of the foreign body supposed to have been swallowed, and (2) as to the probable location of the foreign body.

Too much dependence cannot be placed upon what a child or its parents say it swallowed. In 50 per cent. of my cases I have found that the foreign body is of a different kind from that given in the history; buttons and bones are the favorites.

Cough, cyanosis, and dyspnea are the symptoms usually seen if a fairly large, hard foreign body has entered either bronchus or the esophagus. These symptoms are caused by the presence of the foreign body in the hypopharynx and larynx, and usually only last for a short time.

If the cough is kept up for some time, and especially if it is followed by bloody expectoration, one can be fairly sure of a foreign body in the trachea or bronchus.

If, following the initial cough and dyspnea, the patient has difficulty in swallowing or regurgitation of food the esophagus should be suspected. More pain is usually experienced with a foreign body in the esophagus; foreign bodies in the larynx and trachea may give continuous dyspnea, cough, and cyanosis.

Jackson⁴ points out the very important fact that "very often, after a short time, the tolerance of the air passages manifests itself in a total absence of symptoms;" for this reason foreign bodies are frequently overlooked.

X-ray. Besides knowing the shape of a foreign body, it is of great assistance to know its depth, distance back, and probable angle. These can only be obtained by at least two radiographic views of the chest, with clear, definite outline.

It must be remembered, as shown in one of the cases to be reported, that a foreign body may change its position and angle after the x -ray has been taken.

Instantaneous radiography has been developed to such a degree that many foreign bodies are now located which previously did not show by x -ray.

The importance of careful physical examination of the chest can only be appreciated by those who have attempted to remove foreign bodies from the bronchi which did not show upon the x -ray plate.

The group of physical signs found with foreign bodies in the bronchi must necessarily depend somewhat upon the character, size, shape, weight, etc., of the foreign body and upon its location in the bronchial tree; also, to some extent, do the physical signs depend upon the length of time the foreign body has been in the bronchus.

Local moist rales heard early which gradually extend over the entire chest are practically always present.

Local diminution of the breath sounds with increased resonance over the same area is the rule.

In two cases I have seen there was a decided click or knock heard once only upon each inspiration over the area in which a foreign body was located. This may have been the same sound that Dr. J. W. Boyce⁵ characterizes as "a peculiar dry rale." To me the sound in these cases was of too distinct a character to be termed a rale: it was more like a click or the flap of a valve.

In speaking of the physical signs of foreign bodies, Dr. Boyce⁶ says: "The most common finding is a marked local diminution of the respiratory murmur, together with the presence of accentuation of normal resonance, and this may be rated as the typical condition in foreign body cases."

Moist rales heard over the entire chest, more intense over a certain localized area with diminution of the breath sounds over the same area plus a decided click heard within the area once upon each inspiration, should always lead to broncho-

scopic examination even in the presence of negative history and negative radiographic findings.

I would like to add my belief to that of a number of writers upon this subject: that a more careful study of the physical signs in every foreign body case will eventually lead to a standardization of these signs which will be of much value in diagnosing and localizing obscure foreign bodies.

In bronchoscopy and esophagoscopy, as perhaps in no other branch of surgery, does one's success or failure depend so much upon his assistants, and especially upon the assistant who manipulates the head of the patient.

*CASE 1.—Brass-headed tack removed from the right inferior lobe bronchus.*⁸

Boy, aged eight years, was admitted to the Episcopal Hospital, February 16, 1916, with the history of having swallowed a tack during a fit of coughing while playing with a handful of brass-headed tacks. The father says the child began to cough immediately afterward, was not cyanotic, and had no trouble breathing. For two days the boy played around as usual; nothing was done until the second day, when the boy complained of violent headache and the mother noticed he had fever. Dr. G. J. Kraus was called. The child told the doctor that he had swallowed the tack, and said it stuck in the throat, pointing to the region of the larynx, and complained of pain when he swallowed. The boy was sent to the hospital with a temperature of 101.6°, respirations, 26. An x-ray was first negative, but later showed the tack, head down near the median line, on the right side opposite the sixth dorsal vertebra; reported to be in the esophagus.

Chest Examination. Moist rales were heard over the right chest, a large area of dulness over the right base. Respirations were somewhat increased in frequency, and expansion was limited on the right side. Child had slight cough at times and always coughed when turned on the right side.

The second day after admission the tack was looked for and located with the bronchoscope; the child coughed and apparently dislodged the tack, which could not easily be located again. As the general condition of the child was very bad, further attempts were given up at the time.

Under treatment the child's condition improved very much. Forty-eight hours later, under ether anesthesia, the tack was

located in the right inferior bronchus; the point could not be seen. When grasped by the forceps the point was found to be imbedded in the wall of the bronchus. The tack was backed up, rotated, and the point end drawn into the bronchoscope. The instrument and tack were then withdrawn. Considerable mucopurulent secretion had to be sponged away before the tack could be seen.

Between the first and second attempts at removal, x-ray plates were taken, which showed the location to better advantage. Before the last x-ray, one hour before operation, fine wires were strapped on the chest over iodine lines marked on the skin. This was done to assist in easily locating the depth of the foreign body. After the head was placed in position the exact distance from the teeth to the line on the chest corresponding to the x-ray line covering the foreign body was marked upon the bronchoscope forceps and sponge holders. These locating marks were a decided help in more quickly ridding the bronchus of secretions and locating the tack (Fig. 72).

The whole time for this case was forty minutes. The child reacted nicely from the anesthesia. The general condition gradually improved, and temperature and pulse were normal on the sixth day. On the seventh day after the operation without known cause the child developed subglottic edema and had to be intubated. From the time the tube was introduced he became rapidly better. Two days later the tube was taken out. No further symptoms developed and the patient was discharged one week later, two weeks after the operation, in perfect health. When last heard from several weeks later the child was perfectly well.

CASE 2.—*Open safety-pin in the hypopharynx.*⁸

Male child, aged two years, was admitted to the Episcopal Hospital April 17, 1915, with the following history: Last night about nine o'clock, the child swallowed a safety-pin which he took from some clothes near by. Immediately after swallowing the pin the child began to vomit, which he kept up at intervals all night. Before the accident the child was very talkative; after it he talked very little, and when he did, he cried immediately afterward. The head was held a little to the right and forward, and when an attempt was made to move it the child cried with pain.

X-ray showed an open safety-pin, a little over one inch long, with the point up at the level with the top of the esophagus (Fig. 73).

The child was given a general anesthetic and the pin was located with the direct laryngoscope partly engaged in the mouth of the esophagus, the pointed end sticking into the wall of the right pyriform fossa while the other end protruded forward into the larynx.

The hinged end of the pin was grasped by the esophageal forceps and the pin was gently turned and drawn into the laryngoscope. The pin was removed in three minutes with no injury to the esophagus or larynx.

The second day the patient was discharged from the hospital, having had no symptoms after he came out of ether.

CASE 3.—*Removal of four pieces of peanut-kernel from the right middle lobe bronchus.*⁸

Boy, aged three years, was brought to the Pennsylvania Hospital April 8, 1916, from Freeland, Pa., by the mother, who gave the following history: Nine days before, while eating peanuts, the child started crying. The mouth being full of partly chewed peanuts at the time, the child immediately choked, struggled, gasped for breath, and had a violent coughing attack. He seemed to grow alarmingly distressed. The mother sent for a physician, who administered an emetic, but vomiting gave no relief. The child was taken to a hospital, where an *x*-ray of the chest was negative, and the child was sent home. He continued to have difficulty in breathing and frequent coughing attacks. He became spasmodically dyspneic, often cyanotic, would clutch at the throat, struggle and cry.

Upon admission to the Pennsylvania Hospital, nine days after the accident, his temperature was 101.6°, pulse 132, and respirations 24.

Physical Examination. Showed diffuse, moist rales over the entire chest; over a localized area upon the right side they were more intense. Diminution of the respiratory sounds over the area was heard, together with a distinct click during each inspiration. An instantaneous radiograph taken by Dr. Bowen showed a shadow over the area corresponding to the right middle lobe bronchus. These plates were the best I have ever seen, and were of great aid in localizing the foreign body. Four hours after the child entered the hospital the bronchoscope was passed under ether showing the right bronchial tree to be almost entirely filled with blood-stained mucopurulent secretion, which was carefully sponged away after the method of Jackson. The particles of peanut were finally, after a half hour, located in the right middle lobe bronchus and removed one at a time with fine bronchial forceps. The patient reacted nicely; in about two hours, however, difficulty in breathing occurred, caused by subglottic edema. The child was intubated, the tube being left in place for thirty-six hours, with cold applications to the larynx. The patient had a slight cough, with mucopurulent expectoration and temperature

of 100° for four days, after which the cough and temperature disappeared. For one week after the removal of the foreign body, rales could be heard over the chest, especially upon the right side. They gradually cleared up and the child left the hospital in two weeks apparently in perfect health.

The subglottic edema in this case was due, I think, to an attempt to use too large a bronchoscope at the beginning of the operation.

CASE 4.—*Peach-stone in the esophagus.*⁸

Female, aged twenty-two years, Polish, was admitted to the Episcopal Hospital August 29, 1915. A few hours before she was admitted to the hospital, while sucking a peach-stone, it suddenly slipped back in her throat and was swallowed. After swallowing the peach-stone, she was unable to swallow either liquids or solids. She complained of pain underneath the lower end of the sternum. A few seconds after an attempt to swallow liquids the food was regurgitated. There was no cough, aphonia, or dyspnea.

An x-ray showed a shadow about the size of a peach-stone at the level of the seventh rib in the middle line.

The pharynx and esophagus were cocainized with a 20 per cent. solution. The foreign body was easily located with the esophagoscope and several attempts were made to grasp it with the forceps. The attempt was given up in about twenty minutes, owing to the inability to grasp the body with the forceps at hand. The second day, after other forceps had been obtained, the patient was etherized. The foreign body was again located in the lower end of the esophagus. It was grasped with the forceps and gently pulled together with the esophagoscope to the upper end of the esophagus, where a great deal of resistance was met. At this juncture the forceps slipped from the foreign body. When it was located again it was found in the lower end of the esophagus. Two pair of forceps were broken in twelve attempts to pull the peach-stone through the upper end of the esophagus. Finally, after gripping the body with a strong pair of forceps, slow traction was made for about two minutes which gradually tired the muscular fibers of the cricopharyngeal constriction and allowed the foreign body to come through.

The whole procedure lasted about two hours. For two days after the operation the patient complained of some pain upon swallowing soft diet; the fourth day she was discharged from the hospital having no symptoms.

CASE 5.—*Sweater button removed from the upper third of the esophagus on the twenty-fifth day.*⁸

Boy, aged four years, was brought to the Episcopal Hospital

by the father, who gave the following history relative to the child's present illness. Twenty-three days ago the child was supposed to have swallowed a pin while playing on the floor. Since then the child has not been able to swallow solid food; can swallow liquids only when taken in sips. Has had no history of cough, hoarseness, or difficulty in breathing. Except for a temperature of 100° , pulse 120, and respirations 20, the general examination was normal. Nothing abnormal in lungs, which indicates the foreign body is in the digestive tract.

X-ray of the chest showed a foreign body resembling a 25-cent piece on front view; lateral view showed it to be of greater thickness and located opposite the first and second dorsal vertebræ.

Under ether a sweater button was removed from the upper third of the esophagus with the direct esophagoscope. Very little difficulty was encountered except at the cricopharyngeal constriction of the esophagus, where some resistance was met. The time for removal was five minutes. The next day the child's temperature was 101° . The second day the temperature and pulse were normal, and the child swallowed solids without difficulty.

CASE 6.—*Coin in the esophagus; removal after three weeks.*⁸

Child, aged fifteen months, was admitted to the Episcopal Hospital June 24, 1915, with the following history: Eighteen days ago, while playing on the floor, the child swallowed a 25-cent piece. The parents state that the child turned blue with a fit of coughing and went into convulsions. The child was immediately taken to a nearby hospital, but by the time it reached there the symptoms had subsided. However, the child still would not talk, could only swallow liquids, and cried each time after swallowing. An x-ray was taken, locating the quarter in the upper third of the esophagus. At the time the parents refused operation and took the child home.

Between the date of the child swallowing the coin and the time of admission to the Episcopal Hospital, three weeks later, the child talked very little. The voice was hoarse, and each time upon swallowing liquids the child cried. An x-ray taken at the hospital showed the 25-cent piece in the upper third of the esophagus at the level of the top of the sternum. Under a general anesthetic the esophagoscope was passed and the foreign body easily located. It was firmly imbedded, and some traction was necessary to remove it. As is the custom in foreign bodies too large to remove through the instrument, it was drawn up against the end of the esophagoscope and the instrument and the foreign body drawn up together.

Less than fifteen minutes was required to remove the foreign body. The next day the patient's condition was very good. Two days later he was discharged from the hospital, having had no symptoms, swallowing and talking normally.

CASE 7.—*Bone in the esophagus.*⁸

A woman, aged forty-three years, occupation housework, was admitted to the Episcopal Hospital August 13, 1915, with the following history: About two hours before admission, while eating noodle soup, she felt a sharp object strike the palate, and as she swallowed a second time it stuck in her throat. The patient judged it must have been a bone, because she knew there were some chips of bone in the soup. Her symptoms were pain on swallowing and a constant pain in the throat; no cough or aphonia. She had not attempted to swallow food.

An *x*-ray taken immediately showed the bone on the right side about the fourth cervical vertebra, about three-quarters of an inch long, presenting edgewise to the front, which would indicate the foreign body to be in the larynx or trachea.

The larynx and pharynx were anesthetized with 20 per cent. cocain. Laryngoscopic examination showed nothing in the larynx. The esophagoscope, passed through the laryngoscope into the right pyriform sinus, located the foreign body in the upper esophagus and the foreign body was removed after one unsuccessful attempt. It proved to be a bone, circular in shape, with a diameter about that of a half-dollar, of a varying thickness, about one-eighth of an inch thick at the center, tapering to a transparent thickness at the periphery. The edge of the bone was very sharp, and slight bleeding occurred after removal. After removal the patient had no difficulty in swallowing, and was discharged in two days in perfect condition. The time of the operation, including anesthesia, was thirty-five minutes.

The foreign body had evidently worked further down into the esophagus after the *x*-ray had been taken; when seen with the esophagoscope it was presenting broad side to the front in the upper esophagus, which is the rule with flat bodies in the esophagus. At the first attempt the esophagoscope slipped over the foreign body before it was seen; this is not an uncommon fault, as the cricopharyngeal fold which extends forward from the posterior hypopharyngeal wall often causes the esophagoscope to slip forward over a flat foreign body lodged in the upper two inches of the esophagus. This fault can best be overcome by carefully following the correct high-low method described by Jackson.

CASE 8.—*Particles of nut-kernel removed from the upper third of esophagus on the seventh day.*⁸

This patient, a female child, aged seventeen months, was brought to the Pennsylvania Hospital March 23, 1916, by the father, who gave the following history: Four or five days ago the father says he saw the child swallow a button; since then the child could not swallow solids and took liquids in small quantities with difficulty.

An x-ray was taken of the child's chest which was negative. Owing to a quarantine upon the children's ward at the Pennsylvania hospital the child was referred to my service at the Episcopal Hospital. Two days later, under an anesthetic, the esophagoscope was passed. When it entered the esophagus a whitish mass came into view, which felt semisolid to a probe. An attempt was made to grasp it with foreign-body forceps, but the mass broke easily and was removed in four or five pieces, the largest the size of a pea. Below the nut there was impacted a strip of brownish fibrous material, one-fourth inch wide and about one and one-half inches long, which resembled in appearance a dried blade of grass. After this was removed the esophagoscope was passed gently into the stomach, but no other obstacle was found. The time for the case was six minutes.

The next day the child had no temperature or other symptoms, and swallowed solids normally. The harder fibrous material, I think, had blocked the esophagus and the nut-kernel had lodged against the obstruction, otherwise the nut-kernel would have passed into the stomach.

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2. Peroral Endoscopy and Laryngeal Surgery, Dr. Chevalier Jackson, pp. 270-346.
3. Ibid., p. 203.
4. Ibid., p. 213.
5. Ibid., p. 99.
6. Esophagoscopy and Gastroscopy, Dr. Chevalier Jackson, p. 91.
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8. Reported before the Eye, Ear, Nose and Throat section of the Pennsylvania State Medical Society, Scranton, 1916.

SURGICAL EXPERIENCES WITH ENCAPSULATED EMPYEMA AND ABSCESS OF THE LUNG: A PLEA FOR EXPLORATORY THORACOTOMY¹

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IN the first place it is well to recognize that most empyemas are encapsulated, and that most so-called abscesses of the lung are only encapsulated empyemas which have ruptured into a bronchus. This does not imply that I propose any lengthy discussion of ordinary massive empyemas, nor that in the term abscess of the lung, as used in the title of this paper, I mean to include what I have described above as "so-called abscesses of the lung," *i. e.*, *pleural vomicas*. On the contrary, leaving aside the interesting questions of the diagnosis and treatment of ordinary empyemas, it is my intention to limit my remarks to a discussion of empyemas which are frankly encapsulated, and to point out what I believe are the advantages of exploratory thoracotomy both in these cases and in those of true abscess of the lung.

ENCAPSULATED EMPYEMA. Let anyone look at Fig. 81, representing a cross-section of the thorax at the level of the eighth thoracic vertebra, and tell if he ever saw a case of empyema which he honestly thinks occupied the entire pleural cavity. If he stills thinks so, let him turn his attention for a

¹ Read before the Section on General Medicine of the College of Physicians of Philadelphia, October 23, 1916. Reprinted from *International Clinics*, 1916. Series 26, vol. iv.

moment to the peritoneal cavity which is much more familiar ground, and say whether he ever saw pus (real pus, not turbid serous fluid) occupying the entire peritoneal cavity? Is it not true that by the time real pus has formed in the peritoneal cavity it has become more or less completely isolated, encysted, or encapsulated by adhesions? Even in the most widespread cases of "general peritonitis," in which

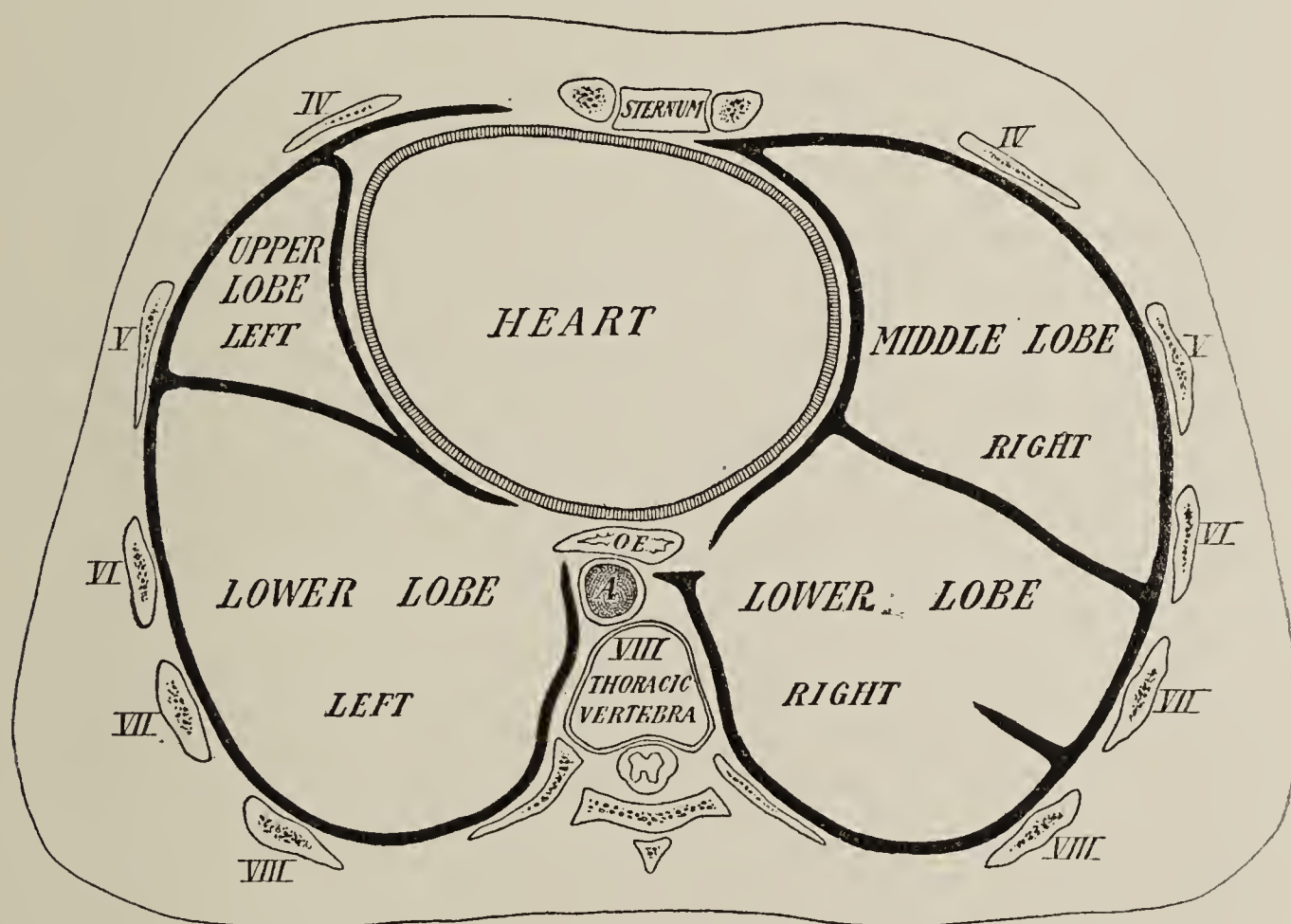


FIG 81.—Cross-section of thorax at level of eighth thoracic vertebra.
Pleural cavities outlined in black.

recovery is scarcely ever observed, what one sees at autopsy is not a quantity of free pus bathing the unadherent intestines, pelvic viscera, stomach, liver, spleen, etc., but it is a mass of adhesions, with here and there, perhaps almost everywhere, pockets of pus of various size. Even if all the pus is found in one place, it is shut in by adhesions, and no pus is to be found in the relatively healthy surrounding areas of the

peritoneal cavity. So it is in the pleura, for even though the pathogenesis of suppurative pleuritis is not well understood by pathologists themselves, certain facts seem to be beyond dispute. It is the usual thing for infection of the pleura to start from the lung tissue, much as that of the peritoneum starts from its contained viscera. And although it is not known that there is any one particular portion of the pulmonary parenchyma from which the infection is prone to start, as it is from the appendix, the Fallopian tube, and the gall-bladder in the abdomen, yet it is generally acknowledged that the infection in pleurisy does not begin simultaneously over the entire surface of the diseased lung, or even of the diseased lobe, but that it commences over a relatively small area of visceral pleura. In the pleura, as in the peritoneum or any other serous membrane, there is at first a serous effusion which changes into a purulent effusion with a speed proportional to the virulence of the infection. Indeed in some cases pus is formed so soon that no previous serous or seropurulent stage can be recognized; but in every case, whether in the pleura or the peritoneum, before true pus is formed, adhesions set certain limits, large or circumscribed, to the cavity in which the pus is found. In this sense, strictly in accord with pathological doctrine, no such thing as "free pus" can exist in a body cavity such as the pleura or peritoneum; or at most it can exist in this free state only for a few hours. It is always rapidly circumscribed, whether the limits set by adhesions are small or large.

Now, I know many will object to this that they have operated on many cases of empyema, especially in children, in which the pus occupied *apparently* the entire pleural cavity: the lung had been pushed back into the spinal gutter and was a negligible quantity, as pus seemed everywhere. But in these very cases it is quite evident, on further consideration, that the pus did not really occupy the entire pleural cavity: for instance, the lobes of the lung did not stand apart from each other, separated by the pus; on the contrary, the lobes

were closely adherent to each other, especially at their margins, thus excluding the pus from the interlobar spaces. Moreover, the lung was adherent along the spinal gutter: it is self-evident that if there had been pus behind the lung as well as on its anterolateral surfaces, the lung would not have been adherent in the spinal gutter, but would have stood forth boldly in the pleural cavity. Thus, instead of pus occupying the spinal gutter, it was excluded from this situation by adhesions formed between the lung and parietal pleura. So, too, with the pericardial and diaphragmatic areas of the pleural cavity: in cases even of massive empyema it is not usual for these areas to be fully exposed and bathed in pus; it is the rule for the lung to be attached to the diaphragm and pericardium by adhesions, perhaps light, perhaps very firm adhesions, and so here also the cavity of the (massive) empyema is not coterminous with the ultimate ramifications of the pleural cavity but is limited by adhesions between the lung and parietal pleura. The reason these massive empyemas are more common in children than in adults no doubt is due to the frequency with which empyema is overlooked in the former, until septic temperature, excessive dyspnea, displacement of the heart, etc., finally make the inexperienced attendant realize that the case is not one merely of "delayed resolution."¹

But even in adults an empyema may approach the massive in size, and yet be strictly encapsulated in the common sense of the term.² No doubt there are all stages between a small encapsulated empyema, a large but still distinctly encapsulated empyema, and a massive empyema such as is so frequently found in neglected cases in children, and which appears not to be encapsulated. It is a truism to state that

¹ In one child, aged three years, under my care a number of years ago in Dr. Hodge's service at the Children's Hospital, the attending physician sent the patient to the hospital with a diagnosis of "postpneumonic pigeon breast." It was an immense *empyema necessitatis*.

² This was pointed out by T. T. Thomas, *Am. Jour. Med. Sc.*, 1913, i, 405, 555.

the smaller the cavity of the empyema the more difficult it is to determine the presence of pus; but failure to appreciate the relatively minute area occupied by some empyemas in their early stages results in the physician thinking no pus is present when he makes one or two dry taps: as a matter of fact the pus is there all along, and his failure to locate it is merely due to his puncture being in the wrong place.

The following cases may be cited in this connection, as examples of large but still distinctly encapsulated empyemas:

CASE I.—*Suspected empyema; punctures negative where physical signs indicated pus; pus finally located elsewhere; thoracotomy; recovery.*

Sam S., aged five years, was admitted to Dr. Hand's service in the Children's Hospital July 22, 1909. Transferred to Dr. Hodge's surgical service July 29, 1909. Recovery.

Present Illness. This began July 18, with chill and high fever; admitted to the medical ward on the fifth day of illness, with a temperature of 103° F., which has continued since. There was pneumonia of the left lung.

July 28. Dr. Hand suspected empyema, but two punctures were negative.

July 29. Two punctures by Dr. Ashhurst, in the anterior axillary line, were also negative, though the physical signs of fluid were present in this situation. A third puncture was then made in the seventh interspace in the posterior axillary line; this point was chosen because it was the site of greatest tenderness, and there was the slightest suspicion of edema of the overlying skin. Although these were the only indications of pus, *it was found*, in spite of the fact that auscultation and percussion indicated no fluid in this situation. The pus drawn by needle was very foul, and as the child was expectorating similar pus, an "abscess of the lung" (pleural vomica) was suspected.

July 29. *Operation* (Dr. Ashhurst). Ether. One inch of the eighth left rib was resected in the posterior axillary line. On opening the pleura there was a squirt of thin turbid pus, smelling of colon bacillus; later some coagula of lymph were discharged. Tube drainage.

August 5. Temperature normal ever since operation.

August 25. There have been two rises in temperature since last note, but recovery finally ensued.

CASE II.—*Empyema encysted on surface of right lung; thoracotomy; recovery.*

Hugh McI., aged forty-three years. Admitted to Dr. Frazier's service in the Episcopal Hospital November 7, 1914. Discharged November 23, recovered.

Present Illness. Had pneumonia four weeks ago, with crisis about three weeks ago, but did not get well. Had fever, cough, and marked expectoration. In bed at home all the time. Has beginning bed-sore.

Condition on Admission. Temperature 101° F. The right lung, from middle down, is flat to percussion, breath sounds and fremitus are absent. Aspiration in the seventh interspace posteriorly gives pus (culture shows pneumococcus). General condition of patient very poor.

November 8. *Operation* (Dr. Ashhurst). Local anesthesia, eucain 2 per cent. Patient prone. One inch of ninth right rib resected in posterior axillary line. Pus found on opening pleura. Cavity of empyema runs up posteriorly as narrow sinus to region of third rib, where cavity is larger (Fig. 82). Lung bound down tight by adhesions. Rubber tube drainage.

November 9. Temperature is normal.

November 18. Tube removed.

November 23. Went home.

September 25, 1916. Nearly two years after operation: Report from patient's wife indicates him to be in his usual health: slight cough, chronic "alcoholic." Incision closed permanently soon after leaving hospital.

From the limits of the empyema cavity found at operation in these cases it is apparent that it was merely good luck or the habit of puncturing near the angle of the scapula which led the physician to make a puncture where pus could be reached. According to the physical signs in Case I no pus should have been present where it was finally located, while in Case II a puncture anywhere over the lower lobe might have been expected to draw fluid, whereas operation demonstrated the main cavity of the empyema over the upper part of the lung, and only a relatively narrow sinus extending down toward the base of the lung (Fig. 82). To be sure, it may be pointed out by physicians that it was merely good luck, or a habit of

resecting one of the lower ribs posteriorly that led the surgeon to find pus on opening the pleura. To this insinuation I propose to reply later, in support of my plea for exploratory thoracotomy. In the meantime, I may cite the following case of encapsulated empyema, in which diagnostic puncture

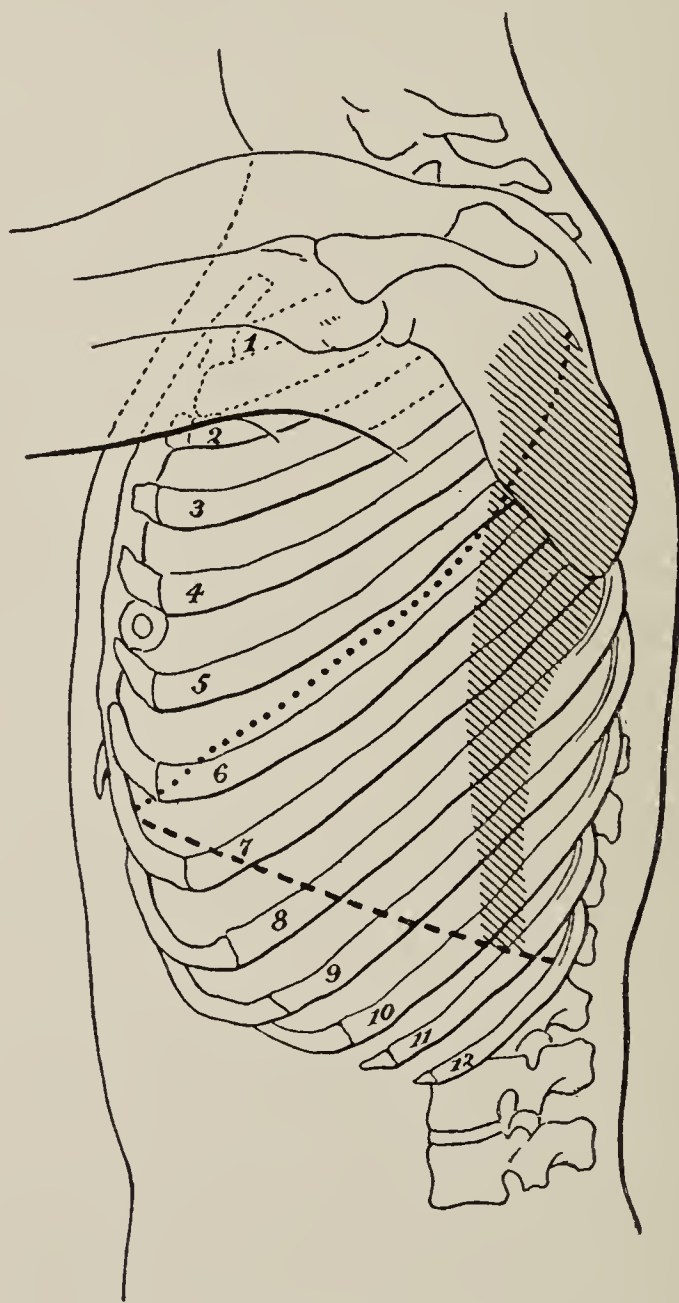


FIG. 82.—Case II. Large, but distinctly encapsulated empyema.

at the usual site revealed pus, and in which the fact that the pus was distinctly encapsulated might not have been recognized had not the surgeon elected to make his opening at the lowest point available for drainage. I think it may be admitted that it was the patient's condition, and not this variation from the usual technic, that prevented ultimate recovery.

CASE III.—*Encysted empyema at base of left lung; death.*

Minnie Y., aged fifty-nine years, admitted to Dr. Piersol's service in the Episcopal Hospital December 10, 1912. Transferred to Dr. Frazier's service for operation December 25, 1912. Died December 31, 1912.

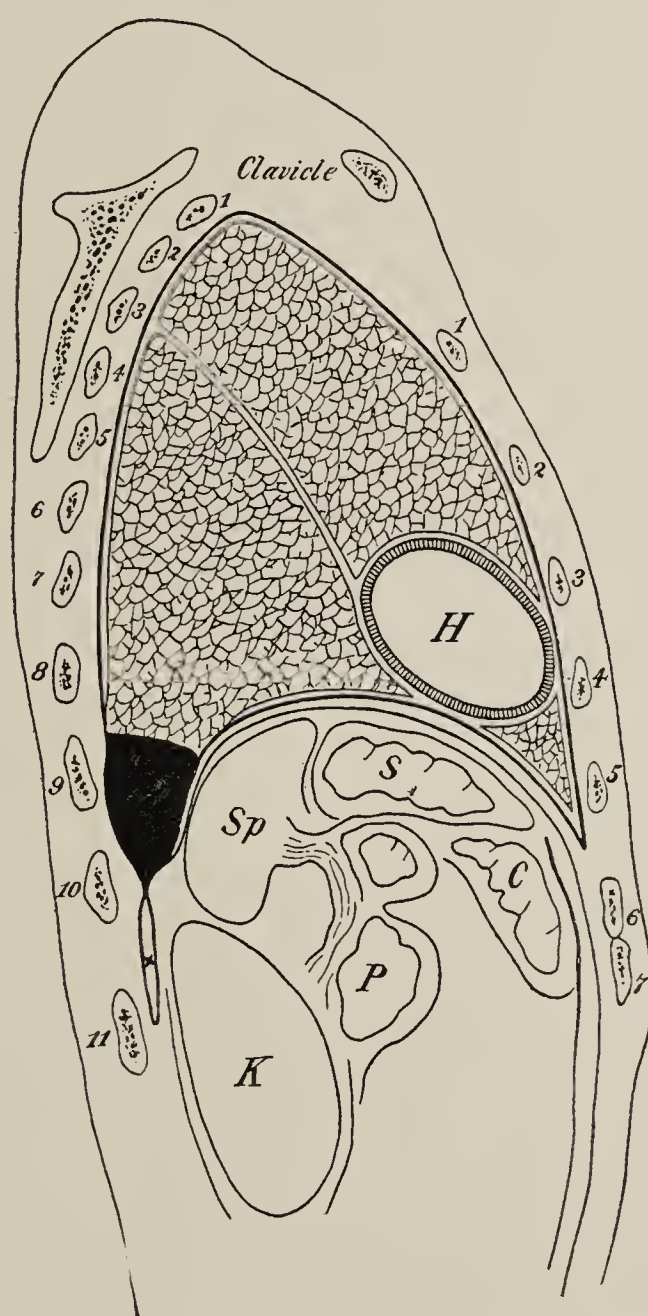


FIG. 83.—Case III. Empyema encapsulated at base of left lung. Sagittal section of thorax through middle of left clavicle.

Present Illness. Ill for four days with pain in the left chest.

Condition on Admission. Pneumonia at base of left lung.

December 15. Temperature fell by crisis (ninth day).

December 20. Dulness persists; empyema suspected: impaired fremitus. Temperature, 99° to 100°. Very ill.

December 24. Temperature suddenly rose to 104.3° F. More toxic. Aspiration gave thick greenish pus, below eighth rib, posteriorly.

December 25. Transferred to surgical ward. Patient appears to be insane; extremely emaciated and weak, with bed-sore.

December 25. *Operation* (Dr. Ashhurst). Local anesthesia, cocain 2 per cent. Patient prone. Excision of one inch and half of eleventh left rib in posterior axillary line. Pleura opened and lung found lightly adherent, showing no tendency to collapse. Pleural cavity above packed off with gauze. With finger burrowed in region of densest adhesions, just *anterior* to and above opening, and beneath ninth and tenth ribs, close to diaphragm (Fig. 83). Thick, semisolid pus welled up with each respiration (culture showed pneumococcus). Rubber tube inserted for drainage, packed around with iodoform gauze. Isolating pack withdrawn.

December 27. Doing very well. Temperature fell to 100° F. after operation, and has remained steady since.

December 29. Drains well. Sloughs removed from bed-sore. Lungs negative.

December 30. Temperature up to 103° F.

December 31. Died of sepsis and exhaustion from bed-sores.

The following case is of interest because it demonstrates that an empyema may be so firmly encapsulated within relatively restricted limits as to necessitate perforation of the thoracic parietes (*empyema necessitatis*) instead of rupture into the pleura or a bronchus; and because this condition was accompanied by a massive but entirely independent pleural effusion, apparently inflammatory, not tuberculous. Probably the seropurulent pleural effusion was analogous to the serous effusion sometimes met with in the general peritoneal cavity in cases of neglected but well walled off intraperitoneal abscesses; or to the serous joint effusion which not infrequently accompanies purulent inflammation of the adjacent bone ends.

CASE IV.—*Encapsulated empyema beneath seventh and eighth left ribs, producing empyema necessitatis; remainder of pleural cavity filled with inflammatory effusion; recovery.*

Joseph B., aged thirty-four years, admitted to Dr. Piersol's service in the Episcopal Hospital December 8, 1915; transferred to Dr.

Frazier's service for operation December 9. Discharged January 7, 1916, recovered.

Present Illness. Three weeks ago developed pain in the left chest and a cough.

Condition on Admission. Temperature 100° F., pulse 92, respirations 20 to 24. Leukocytes 22,000, with polynuclears 89 per cent. He complains of pain in the lower left chest, and has slight cough. Is not toxic nor dyspneic. There is bulging of the anterolateral chest wall on left; this area is dull red, extremely tender, resistant from anterior axillary line into axilla. Respiratory excursions are limited over the left lower thorax, and vocal fremitus is absent below nipple in front, and in axilla, and below angle of scapula posteriorly. There is Skodaic resonance over the upper left lung. Traube's semilunar space seems obliterated. There is flatness and absent vocal resonance over left chest below level of nipple, and the breath sounds are inaudible. The right lung shows puerile breathing throughout, and dry rales.

The left chest was tapped posteriorly and turbid straw-colored fluid, not true pus, was obtained. The laboratory report (Dr. C. Y. White) showed a gelatinous fluid, 320 cells per c.mm., of which 80 per cent. were polynuclears, and only 20 per cent. lymphocytes. Cultures remained sterile, and injection into guinea-pig gave no evidence of tuberculosis. The blood Wassermann was negative.

December 9. Evidently there is an extrathoracic abscess over left anterolateral chest wall, and an inflammatory exudate in pleura. Transferred to surgical ward for operation.

December 9. *Operation* (Dr. Ashhurst). Local anesthesia novocain, 0.25 per cent. (1) Patient prone: Resected two inches of eleventh left rib, posteriorly. There was a profuse discharge of slightly turbid fluid, with no odor; the diaphragm comes up against wound in expiration, and fluid is discharged only when diaphragm is pushed away. Finger introduced feels no adhesions; lung too much compressed by fluid to be felt. From 10 to 12 ounces of fluid were evacuated during exploration, and on inserting a rubber tube upward for four inches a stream of fluid drains off, and continues to drain while this incision is dressed. (2) Patient then turned on his back, and also under local anesthesia the subcutaneous phlegmon was opened by a separate incision: thick yellow inodorous pus was discharged (culture showed staphylococcus). This pus had spread over an area about three inches in diameter, superficial to the ribs and had discharged between the seventh and eighth ribs through an orifice admitting the little finger into a walled-off intrathoracic

cavity about three inches in diameter, beneath the seventh and eighth ribs (encapsulated empyema) (Fig. 84). Drainage by strip of iodoform gauze.

December 10 to 13. Temperature 98° to 103° F.

December 15. Temperature steady, from 98° to 99.4° F.

December 25. Tube removed from posterior wound.

December 29. Out of bed.

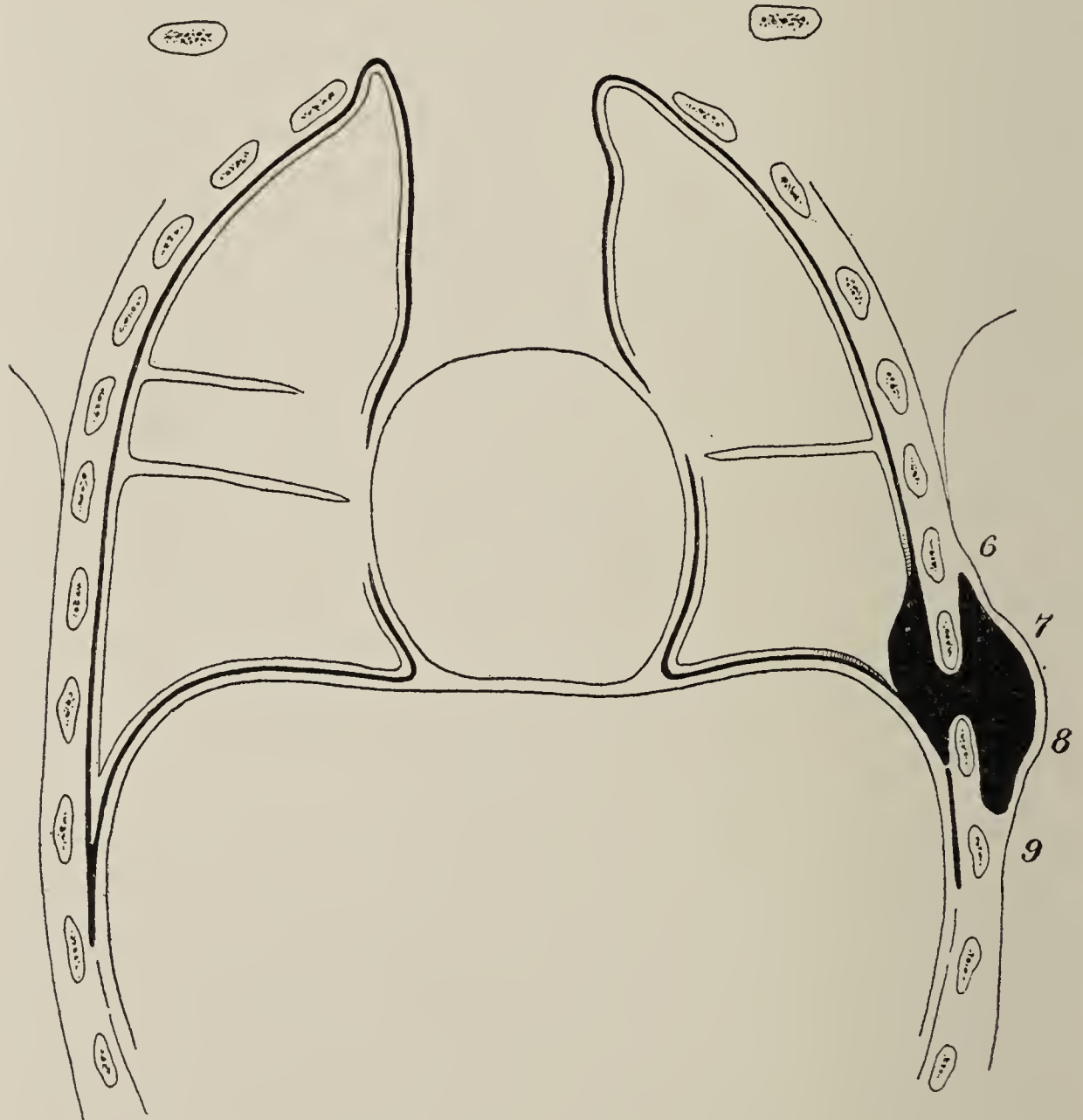


FIG. 84.—Case IV. Encapsulated empyema (*necessitatis*) discharging into subcutaneous tissues between seventh and eighth ribs.

January 7, 1916. No discharge. Went home at own request.

September 20. Returns for examination. Resumed work two months after leaving hospital, and has worked ever since without disability. Both wounds are solidly healed. There is no deformity, and the lung is normal to physical examination.

The *diagnosis* of encapsulated empyema is justly considered very difficult; it is especially difficult when the pus is at no place in contact with the chest wall. Such empyemas are frequently found between the lobes of the lung, between the lung and the diaphragm, or against the pericardium. The importance of attentive examination in the region of the fissures was emphasized by Musser (*Jour. Am. Med. Assn.*, 1907, i, 24) in his clinical teaching, and Sinkler has called renewed attention to it (*Medical and Surgical Reports of the Episcopal Hospital*, Philadelphia, 1914, ii, 153). The location of these fissures should be constantly borne in mind (Figs. 85, 86, and 87). Examination with the Roentgen rays may be of the greatest aid in locating a collection of pus in the thorax, but unfortunately it is not possible in all cases to secure as clear negatives as are necessary to exclude the presence of an encysted empyema, much less such as will certainly locate an abscess in a definite spot.

Thus there arise cases, every once in a while, where numerous punctures prove unsuccessful in locating the pus, even though the physician may have the boldness to puncture over what appears to be reasonably healthy lung, as well as over regions where the physical signs indicate the presence of fluid. Yet in some of these cases it is morally certain that pus is present. The question now arises whether it is to the patient's best interests to be left alone until the empyema ruptures into a bronchus or until death occurs from sepsis without such rupture? or, on the other hand, whether it is not merely a matter of common sense to turn these patients over to the surgeon and let him do an exploratory thoracotomy and so attempt to locate and drain the abscess?

It is many years now since physicians, perhaps rather unwillingly, became convinced that in the case of abdominal abscesses exploratory laparotomy was less dangerous than exploratory puncture; and the great frequency with which healthy peritoneum is opened, is isolated by gauze packs, while the focus of suppuration is searched for, found and

evacuated transperitoneally, is no longer a matter of comment. I must confess I was filled with chagrin on a recent visit to a neighboring city to be shown a postmortem specimen of an interlobar empyema, and to be told by the surgeon

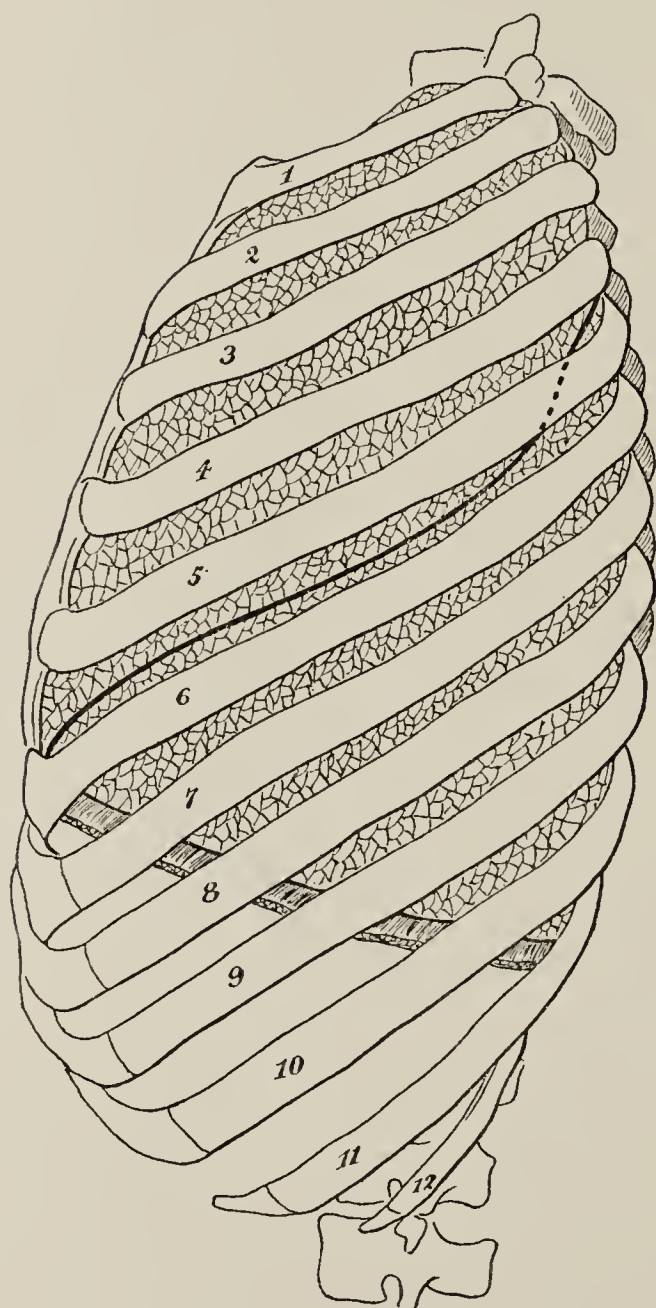


FIG. 85

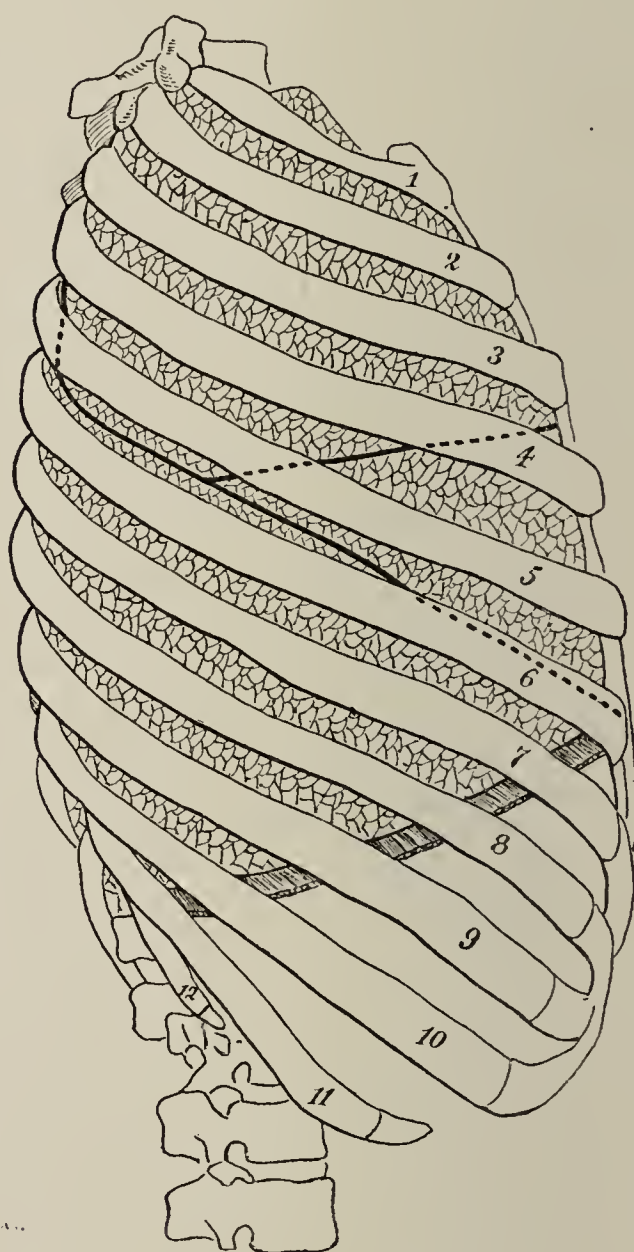


FIG. 86

FIGS. 85 and 86.—Interlobar fissures and their relation to the ribs.

in charge of the case that the patient had been allowed to die without the chance of recovery afforded by operation. The reason alleged was that, although pus had been located by the puncture made by the medical men under whose care the patient had previously been, yet when the patient came to

the operating-room and the surgeon aspirated again he had failed to find pus; and "he made it a rule not to operate unless he found pus." To my query whether medical pus was not as good as surgical pus, I received no satisfactory reply. Yet I fear that many surgeons are of this opinion, and make it their rule not to operate on patients with suspected empyema

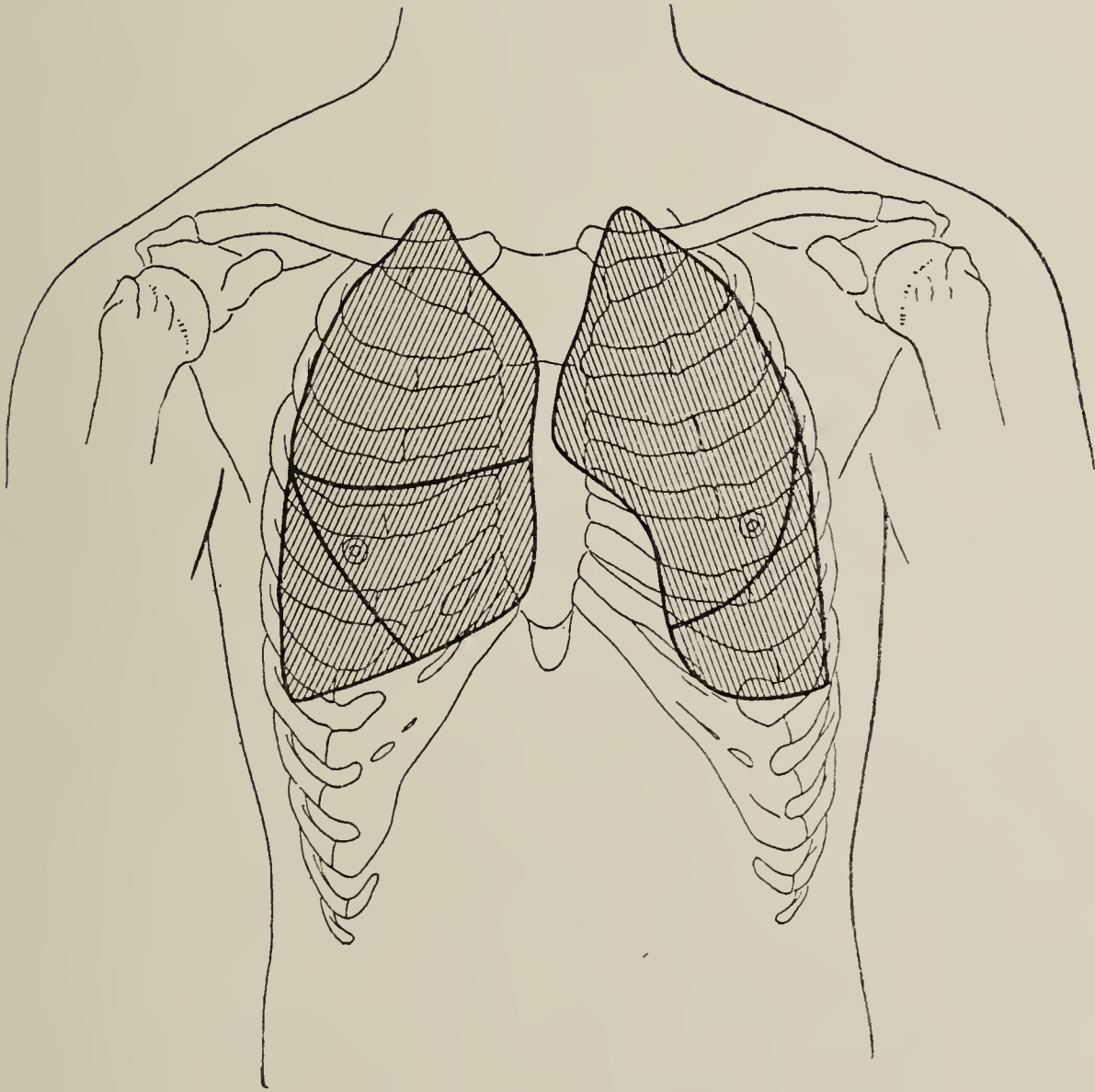


FIG. 87.—Fissures of the lungs viewed from the front.

unless they themselves locate pus by exploratory puncture when the patient is put on the operating table. I am happy, however, to know that some progressive physicians entertain a better idea of the possibilities of surgery than do many surgeons. Dr. Lord, in his book on *Diseases of the Lungs and Pleura* (Philadelphia, 1915, p. 526) commends "exploratory

incision," "when there is good reason to suspect pus which cannot be demonstrated by exploratory puncture." Dr. Alfred Hand tells me that he has sometimes asked the surgeon to explore the chest under similar circumstances, only to be met by the reply, "You find the pus, then I will drain it for you." Dr. Piersol and Dr. Robertson have turned over to me several patients in whose cases they frankly confessed themselves unable to locate the pus certainly by physical signs or diagnostic puncture, though every symptom indicated its presence; and it has been my good fortune in some of these cases, though not in all, to find the foci of suppuration by exploratory thoracotomy, and thus to save the patients' lives. I do not, of course, mean to deny that some patients will recover after the rupture of an interlobar empyema through a bronchus (Lord observed 5 such cases, but only 2 of the patients recovered); nor that they may not survive until the pus seeks to discharge itself externally in the form of an *empyema necessitatis*; but I do venture to assert that less risk is run by prompt resort to exploratory thoracotomy.

CASE V.—*Interlobar empyema (right) ruptured into bronchus; operation; death.*

William L., aged fifty years, admitted to the Episcopal Hospital, in Dr. E. J. Morris's service, July 26, 1912; transferred to service of Dr. W. E. Robertson August 1; transferred to Dr. Frazier's service, for operation, September 13, 1912.

Family History. The patient's father, grandmother, and one brother died of tuberculosis of lungs.

Previous History. Had pertussis as a child. Has always used tobacco and beer to excess.

Present Illness. This began ten days ago as sudden sharp pain in right side, after lying on that side on the grass all one evening. This pain gradually subsided in the course of a few days, but the patient became short of breath. His family physician gave him medicine without effect. He walked to the dispensary of the hospital, and was sent to the ward.

Condition on Admission. He is a large, full-blooded man, dyspneic, with constant cough and expectoration. He coughs up

daily about a pint of very foul smelling pus. He cannot sleep, and cannot speak above a whisper. Leukocytes numbered 16,680. Sputum was negative for tubercle bacilli and for *B. fetidus*.

Physical Examination. The right chest is flat below the fourth rib, with hyperresonance above. Rales and harsh breathing at right apex, and absent breath sounds and fremitus below the fourth rib. There is impaired resonance at the left apex; otherwise left lung is normal.

July 27. Temperature is hectic, 99° to 102° F.

August 6. Dr. C. C. Eves examined the patient on account of aphonia, but found nothing except acute laryngitis.

August 18. Continues to grow weaker.

September 3. Aspiration negative below angle of right scapula. Still septic, temperature 99° to 102° F.

September 7. Aspiration again negative below angle of right scapula. Dr. Robertson then introduced oxygen into pleura until dyspnea was produced and entire area of dulness became tympanitic. Dyspnea soon disappeared and patient became comfortable.

September 9. Dulness as before over right chest.

September 10. Oxygen again introduced into pleura. Patient nearly died; unconscious for fifteen minutes, pulse 150; revived by artificial respiration. Temperature now ranges from 99° to 103° F.

September 11. Improved; dyspnea has disappeared. Sputum has been negative for tubercle bacilli and for elastic fibers at five separate examinations.

September 13. Transferred to Dr. Ashhurst's care (Dr. Frazier's service). Patient is very dyspneic, and coughs frequently until expectoration of very foul greenish material. Pulse is fairly strong (92 to 96), respirations 28 to 32; temperature over 100° F. He has no pain. The whole right chest is dull below middle of scapula, and over the same region the breath sounds are weak and many crackling rales are heard. Below the angle of the scapula for a distance of two ribs, the breath sounds are amphoric.

September 14. *Operation* (Dr. Ashhurst). Local anesthesia, eucain 2 per cent. Patient prone. Incision in eighth right interspace, back of posterior axillary line. About two inches excised from eighth and ninth ribs. Patient complained of some pain in abdomen. Pleural cavity opened, and found filled with bloody fluid (smear showed a diplococcus). Lung densely adherent to dome of diaphragm and to parietal pleura beneath sixth to eighth ribs in front of their angles. Gauze packs introduced to wall off pleural cavity. With finger burrowed into adhesions in region of

fissure of lung. Breaking through these opened a cavity (3 by 2 inches) in lung tissue, and a couple of ounces of greenish fetid pus (same as that expectorated) were evacuated (pus from lung abscess showed streptococci). The opening in lung was enlarged with

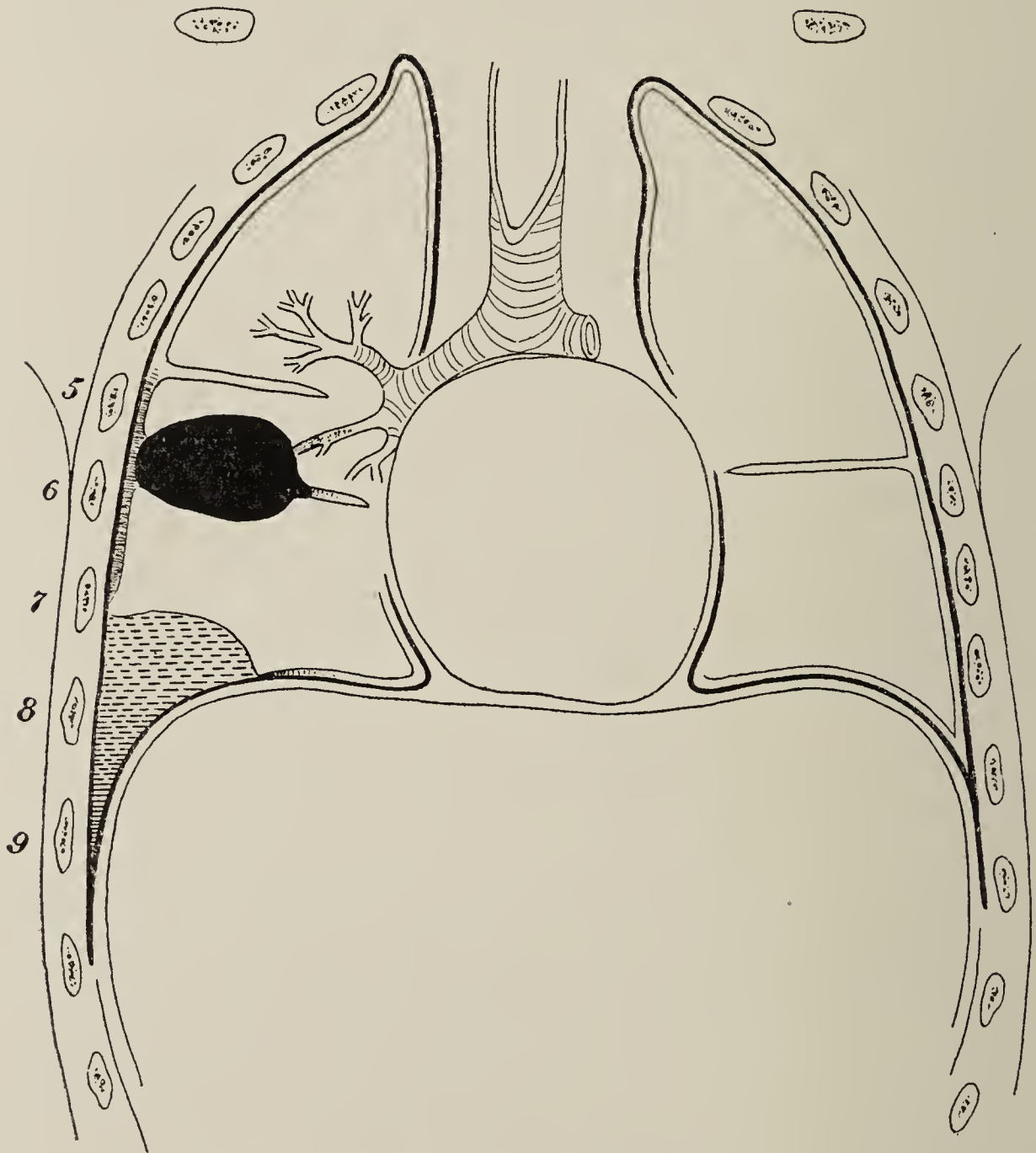


FIG. 88.—Case V. Interlobar empyema ruptured into a bronchus (pleural vomica). Note pleural effusion in costophrenic sinus.

fingers, and large rubber tube put in cavity of lung, and surrounded with iodoform gauze. Time of operation thirty minutes (Fig. 88).

As soon as the patient was turned on his back at conclusion of operation he asked for his supper, which he ate with relish.

September 15. Very dyspneic; pulse very rapid and weak. Tube in lung drains large amount of fetid green pus; wound is dressed three times daily.

September 16. Died 4.30 P.M., forty-eight hours after operation. No autopsy.

In the foregoing case the long duration of the patient's illness and his extremely septic condition rendered final resort to operation a forlorn hope. Of course, it is mere speculation to suggest that external drainage of the abscess a month or six weeks earlier might have permitted his recovery. In another patient, in whom an empyema (insufficiently drained by an intercostal incision by another surgeon) had re-accumulated and had ruptured into a bronchus, I was more successful, and recovery followed the second operation with rib resection.

CASE VI. — *Recurrent empyema discharging through bronchus; thoracotomy; recovery.*

Edna P., aged seven years. After six weeks illness following pneumonia, an empyema (left) was drained by an incision in the sixth intercostal space. Five weeks after this operation, the patient first came under my care at the Episcopal Hospital, August 1, 1913. The incision of the previous operation was entirely healed. The temperature was 103° F., and there were the usual physical signs of fluid at the base of the left lung. Two punctures were negative. Leukocytes, 26,000.

August 5. Temperature continues septic.

August 10. Coughed up some pus. Examination showed no tubercle bacilli, but diplococci.

August 13. Old incision broke open during night, and a very little pus discharges.

August 19 to 24. No improvement. Child feels ill. Temperature still high.

August 25. Better. Thick yellowish expectoration. Temperature falling. Operation has been postponed in hope that recovery might follow the rupture of pus into the lung. Skiagraph, after injection of bismuth paste into the sinus shows a cavity extending from the fourth to eleventh ribs. Owing to size of this cavity and slow improvement, it was now decided to operate.

August 27. *Operation* (Dr. Ashhurst). Ether. Patient prone. Resection of one inch of eighth and ninth ribs near their angles,

opening the cavity in the pleura. No communication with bronchi evident. Large amount of bloody pus and the remaining bismuth paste were evacuated, and some of the adhesions between the lung and costal pleura were separated. Drainage by rubber tube and iodoform gauze.

September 18. Tube removed permanently. Convalescence was very slow, owing to the child's emaciated condition.

October 22. Sinus entirely healed. Out of bed some days.

October 27. Went home.

September 6, 1916. Examination over three years since operation shows the girl apparently in good health. There are no subjective symptoms; the wound has remained permanently closed, and the resected ribs have been reformed. There is very slight scoliosis convex to the left (the left chest was the seat of empyema, but appears less contracted than the right). The girl attends the State Dispensary for Tuberculosis.

In the following case, resort to exploratory thoracotomy less than two weeks after the child's admission to the hospital, though not successful in enabling me to locate pus at the time of the operation, nevertheless resulted in eventual recovery because the empyema broke into the wound a week after operation. This event is certainly less fatal than rupture of the empyema through a bronchus.

CASE VII.—*Empyema encysted between upper and middle lobes of right lung; not found at operation; later burst into wound; recovery.*

Tony V., aged two years, sent by Dr. R. S. Hooker, admitted to Dr. Frazier's service at the Episcopal Hospital, November 10, 1915. Discharged February 5, 1916, recovered.

Present Illness. Treated at home for three weeks for pneumonia. Seen first today by Dr. Hooker, and diagnosis of empyema made, and sent to hospital.

Condition on Admission. Temperature 102° F., pulse 108 to 148, respirations 32 to 40. Leukocytes 25,000. Poorly nourished child; thin profuse nasal discharge. Pharynx unusually red. Thorax is resonant to percussion throughout; there are a few rales low in the right axilla, and breath sounds are harsh around the angles of both scapulæ.

November 11. Aspiration (numerous punctures) of right pleural cavity revealed no fluid. Temperature is down.

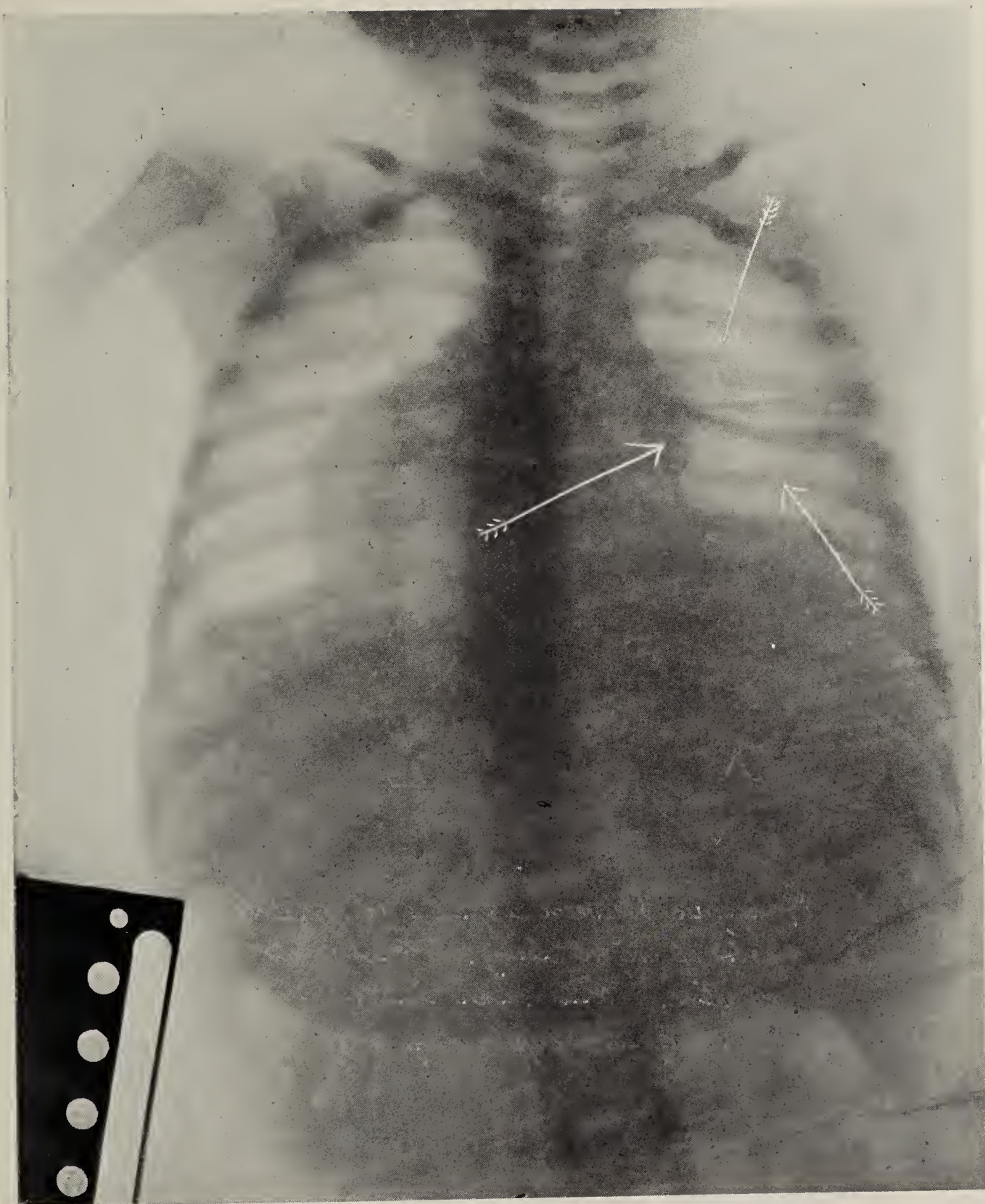


FIG. 89.—Case VII. Empyema encysted between upper and middle lobes of right lung (see arrows). Not located at operation, but discharged through drainage tract eight days later.

November 13. Temperature up.

November 15. Aspirated again in left axilla, but no fluid obtained.

November 16. Leukocytes, 36,640; polynuclears, 46 per cent.; lymphocytes, 40 per cent.; hemoglobin, 59 per cent.

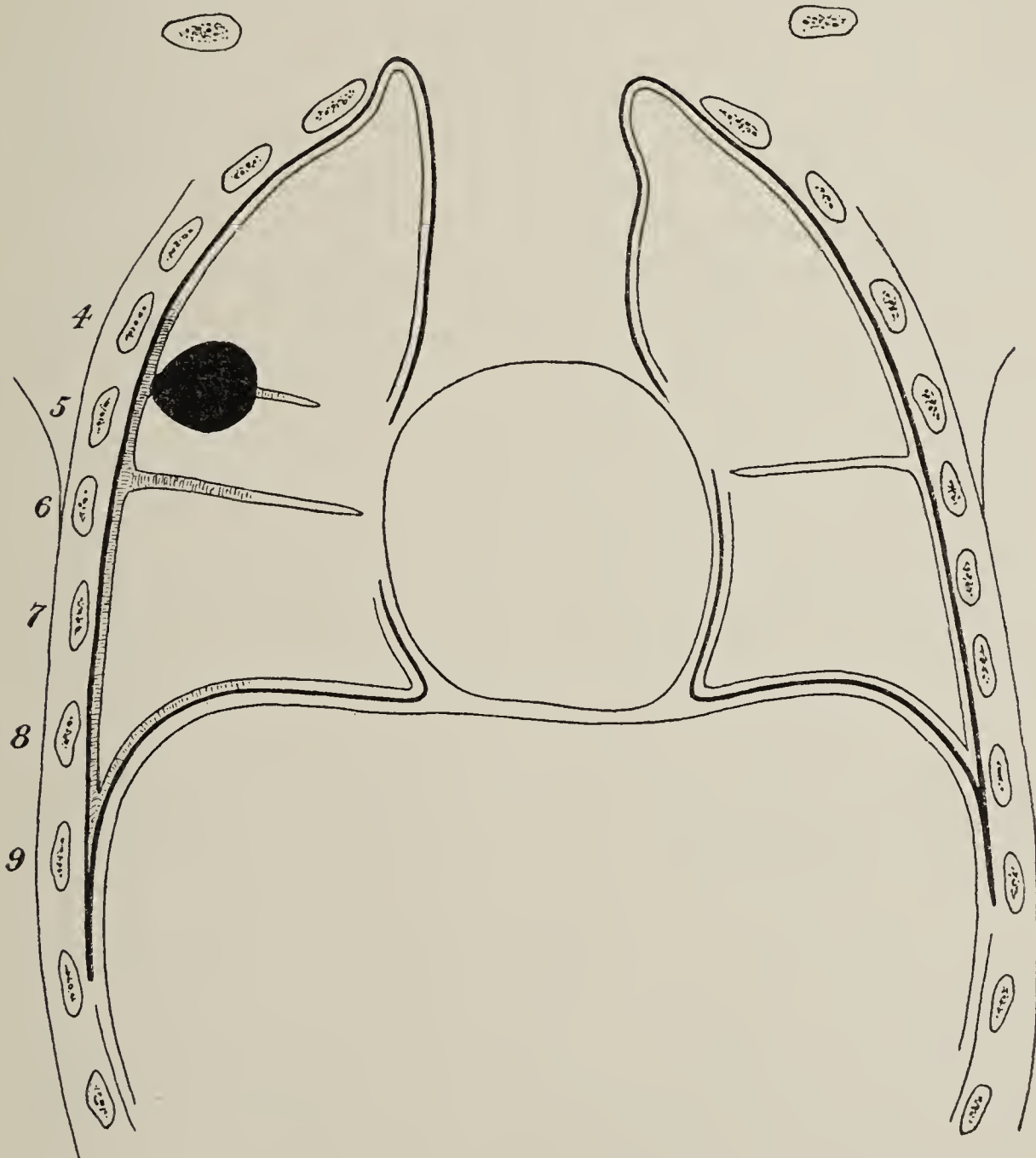


FIG. 90.—Case VII. Empyema encysted between upper and middle lobes of right lung; not found at operation. Later ruptured into drainage tract.

November 17. Temperature down.

November 18. Temperature up.

November 19 to 23. Temperature 100° to 103° , irregular. As it appeared probable that pus was present, exploratory thoracotomy

was determined on. Dr. W. E. Robertson located pus under sixth rib, from physical signs. X-ray (Fig. 89) inconclusive.

November 23. *Operation* (Dr. Ashhurst). Ether. Patient prone. One inch of seventh right rib resected below angle of scapula; pleura opened and found to be thickened. No pus was found; the lung was lightly adherent to parietal pleura and to diaphragm all over, but was readily separated. No dense adhesions could be felt. The middle and lower lobes were separated but no collection of pus found (Fig. 90). A rubber tube was left in for drainage, in hope that the pus, if any was present, might rupture externally in time.

November 26. Wound is clean.

November 29. Temperature has fallen gradually to normal.

December 1. Today there is considerable discharge on dressings, with odor of pus. Culture from the sinus showed streptococci and staphylococci. Temperature 101° F.

December 3. Still considerable drainage.

December 8. Discharge is scanty.

December 12. Very little discharge.

February 5, 1916. Went home, sinus entirely healed.

September 6, 1916. Nine months after operation, child returned for examination. Found in perfect health. Rib has reformed; lung is normal, and there is no deformity.

In the next two cases (VIII and IX) pus was found by exploratory thoracotomy, and this measure undoubtedly saved the patients' lives.

CASE VIII.—*Empyema encysted between left lung and diaphragm; recovery.*

Philip Q., aged fourteen years, referred by Dr. Diamond, was admitted to Dr. Piersol's service in the Episcopal Hospital December 27, 1915; transferred to Dr. Ashhurst's service January 13, 1916; discharged February 26, 1916, recovered.

Present Illness. Two weeks ago had a chill, complained of headache, vomited several times, and had generalized slight pain. After a few days felt better and went out of the house. Then right ear began to ache. Two days ago he developed cough, and became constipated. Has had no appetite since illness began. Has now cough, coryza, and slight dyspnea.

Condition on Admission. Fairly well built, slender lad, not emaciated, no adenopathy. Heart is not enlarged nor displaced,

apex beat in usual location, no murmurs, sounds of fair quality. *Lungs are negative*: good breath sounds; good resonance throughout. Abdomen is negative. Leukocyte count, 11,040. Temperature is septic (Fig. 91).

December 30. Marked diminution in breath sounds over left base, posteriorly; a few sonorous rales in lower left axilla. Sputum negative for tubercle bacilli.

January 2, 1916. Widal negative.

January 4. Marked bronchial breathing over right apex posteriorly. Leukocytes, 19,960. Temperature still septic.

January 6. Blood culture shows a growth of short chain streptococcus (Dr. C. Y. White). Blood negative for malarial parasites.

January 10. Sputum again negative for tubercle bacilli.

January 12. Dulness on percussion and great tenderness at left base posteriorly. No fluid obtained by exploratory puncture.

January 13. Examined by Dr. Ashhurst. Has been in medical ward two weeks and a half with septic temperature (100° to 104° F.), with chills; blood culture shows streptococcus. Is markedly emaciated. The left lung is dull at the base, and all signs of empyema are present, but needle found no pus. Is very tender in left costovertebral angle. Excursion of costal margin away from midline is not increased in inspiration compared with excursion of the right costal margin, which is against diagnosis of subphrenic abscess (Hoover's test). X-ray (Fig. 93) (not properly interpreted until after operation) shows dense shadow above left diaphragm, its upper level being horizontal, not domed as is the normal diaphragm, and higher than the level of the diaphragm on the right side. As the presence of pus was practically certain, exploratory thoracotomy was recommended, and the patient was transferred to the surgical service.

January 14, 1916. *Operation* (Dr. Ashhurst). Local anesthesia, novocain 0.25 per cent. Patient prone. Excised two inches of left tenth rib, posteriorly. On opening pleura, lung showed no tendency to collapse. The costal attachments of the diaphragm were exposed in the wound, and the diaphragm was found to be normal to palpation; the spleen was easily palpated through the diaphragm, and there was no suggestion of a subphrenic abscess. A retractor placed under the ninth rib, against the parietal pleura, caused pain, so a general anesthetic (gas-oxygen) was employed. The skin incision was now extended backward, and two and a half inches more of the tenth rib was resected at its vertebral extremity. Packing off the upper pleural cavity brought to plain view the lung

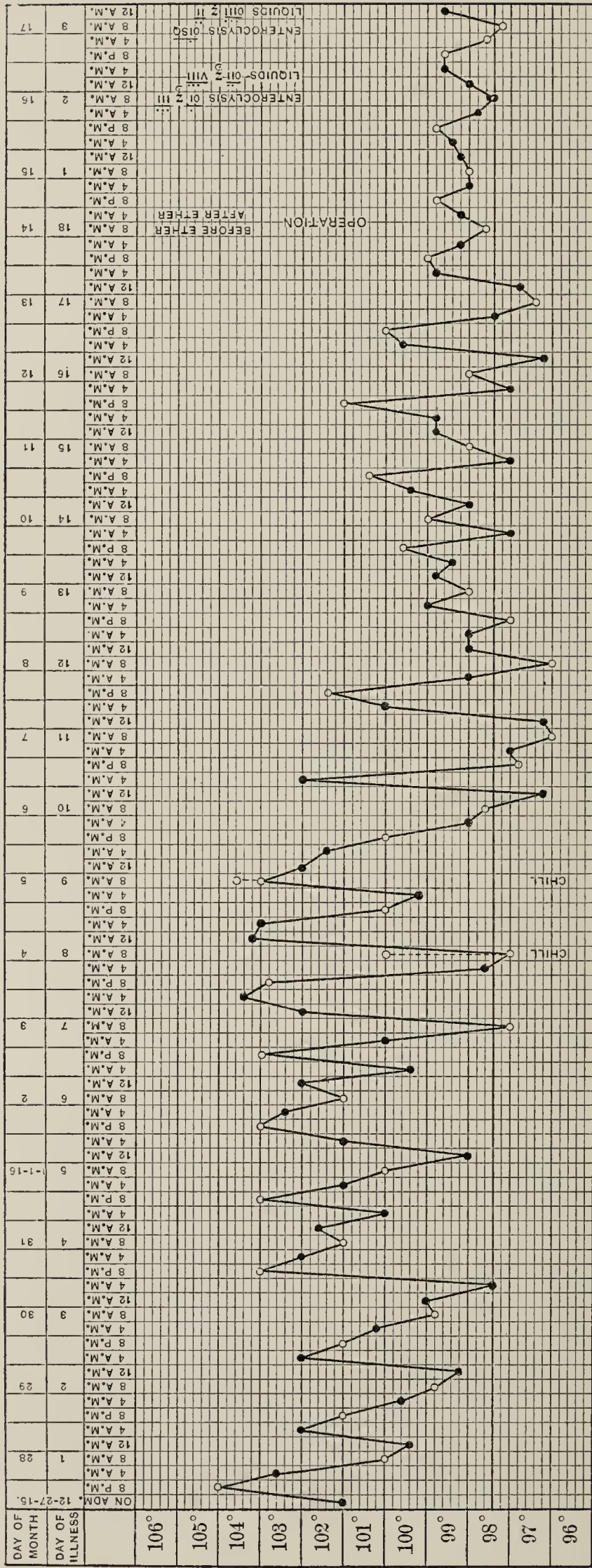


FIG. 91.—Case VIII. Temperature chart showing effect of drainage of encapsulated empyema. Streptococci found in blood culture and in thoracic pus.

plastered against the dome of the diaphragm (Fig. 92). The lung was next carefully separated from the diaphragm with the fingers, whereupon a flood of pus (at least one pint) was evacuated. (Culture gave a pure growth of streptococci). The lung now collapsed.

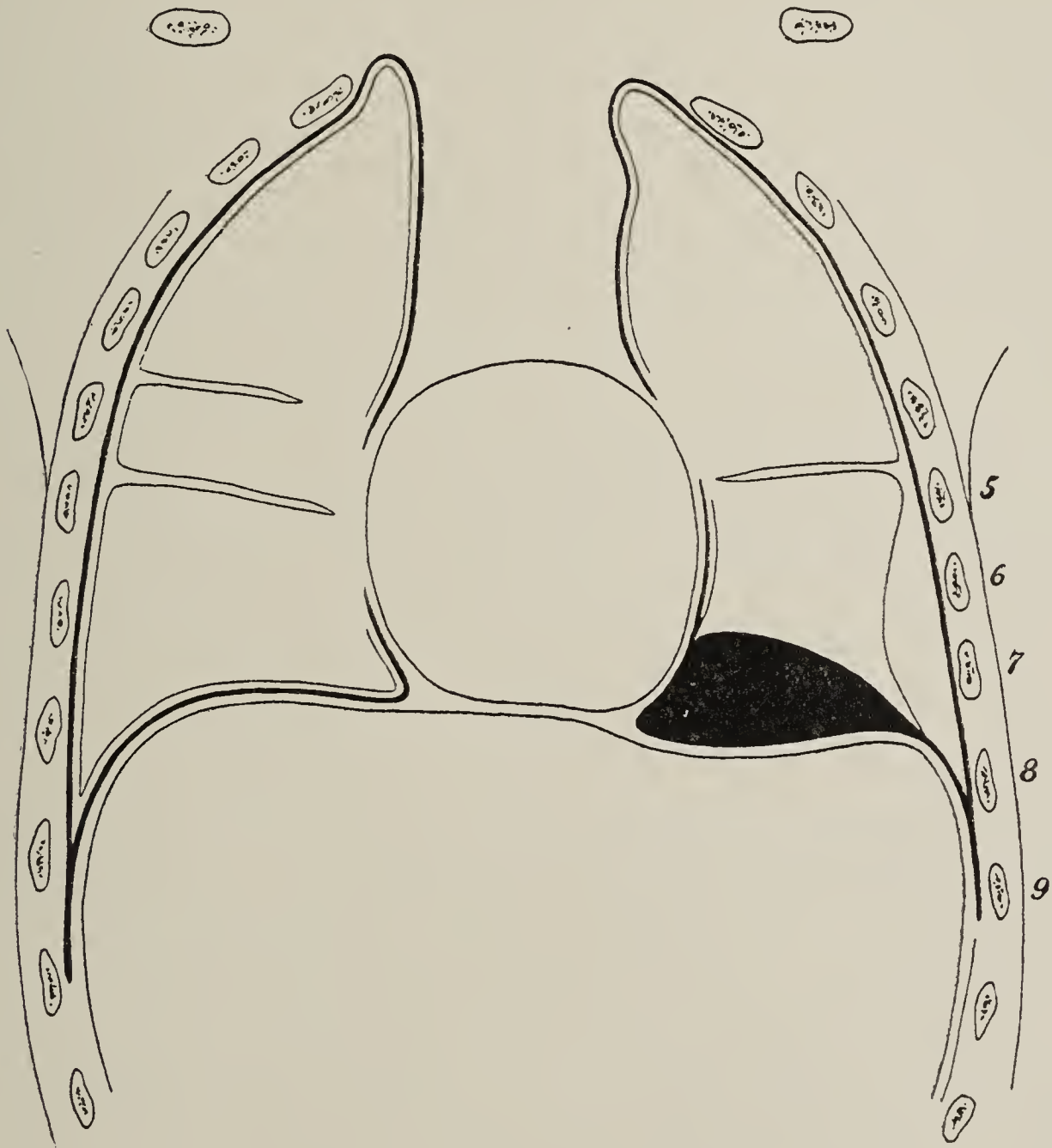


FIG. 92.—Case VIII. Empyema encysted between left lung and diaphragm.

Rubber tube and iodoform gauze drainage were left between lung and diaphragm, and the ends of the incision in the thorax were closed.

January 15. Looks better; is quiet and comfortable, but very weak and thin. Is given continuous enteroclysis, and all the liquids by mouth he will take. Temperature normal.

January 17. Temperature 98° to 100° F. ever since operation. Eating better.

January 22. Tube shortened.

January 25. Tube removed. Rapid improvement continues.

January 31. Up in chair.

February 14. Able to walk.

February 26. Sent home.

August 9, 1916. Examination seven months after operation shows the boy in good general health. Sinus just admits a probe, and requires dressing three times weekly. Scoliosis is developing.

November, 1916. The sinus closed permanently two weeks after last note, when it was no longer packed with gauze at each dressing.

CASE IX.—*Empyema encapsulated between upper and middle lobes of right lung; recovery.*

William B., aged thirty years, was sent by Dr. R. S. Hooker, and admitted December 22, 1915 to Dr. Piersol's service in the Episcopal Hospital; transferred to Dr. Ashhurst's service for operation January 14, 1916; and discharged February 3, 1916, recovered.

Present Illness. Six weeks ago he developed pain in the back and slight dyspnea; then he began to cough, with slight mucopurulent expectoration. Yesterday he had pain in the right side at costal margin, worse cough, and some dyspnea, which rapidly has become worse.

Condition on Admission. Temperature, 103° F.; pulse, 104 to 108; respirations, 32. Leukocyte count 10,000, with polynuclears, 91 per cent. He is a well-developed man, evidently dyspneic, *alæ nasi* moving with each respiration. The lungs show impairment of resonance over right side, most marked in middle and lower lobes; tactile and vocal fremitus are decreased, and there is bronchial breathing with moist rales over the middle and lower lobes. There are a few sonorous and crepitant rales over the right upper lobe. The left lung is negative. The heart is normal. The liver is enlarged 5 cm. below the costal margin.

December 26 to 27. Temperature fell by lysis to 100° F.

December 30. General condition has improved, but temperature varies from 100° to 103° F.; there is marked bronchial breathing over middle of right lung posteriorly.

January 3 to 13, 1916. Temperature varies from 101° to 102° F., very irregular. Patient's condition does not improve. Puncture in eighth interspace drew only blood.

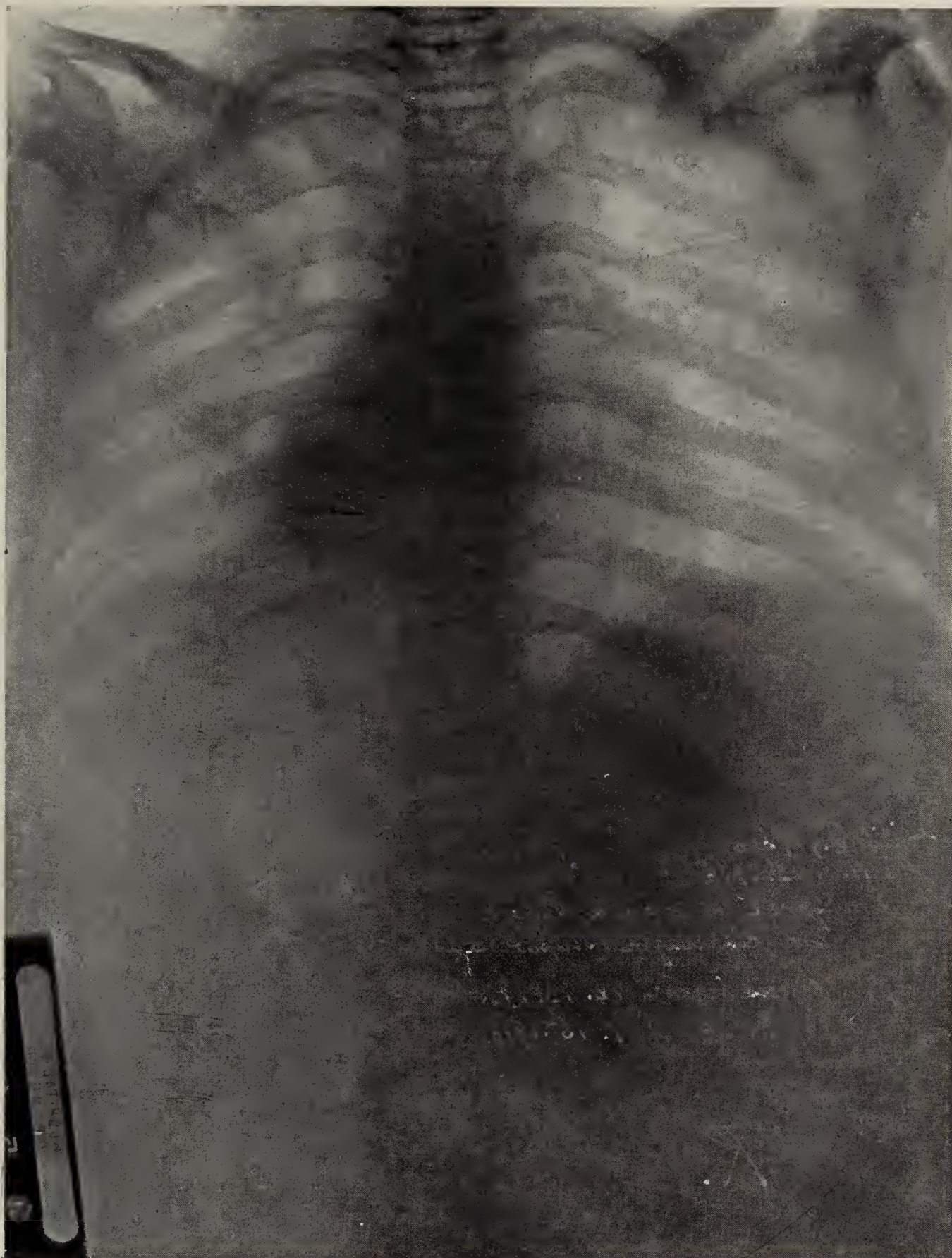


FIG. 93.—Case VIII. Pus between left lung and diaphragm. Note shadow on left as high as diaphragm on right; upper level flat, not dome-shaped. Heart displaced to right.

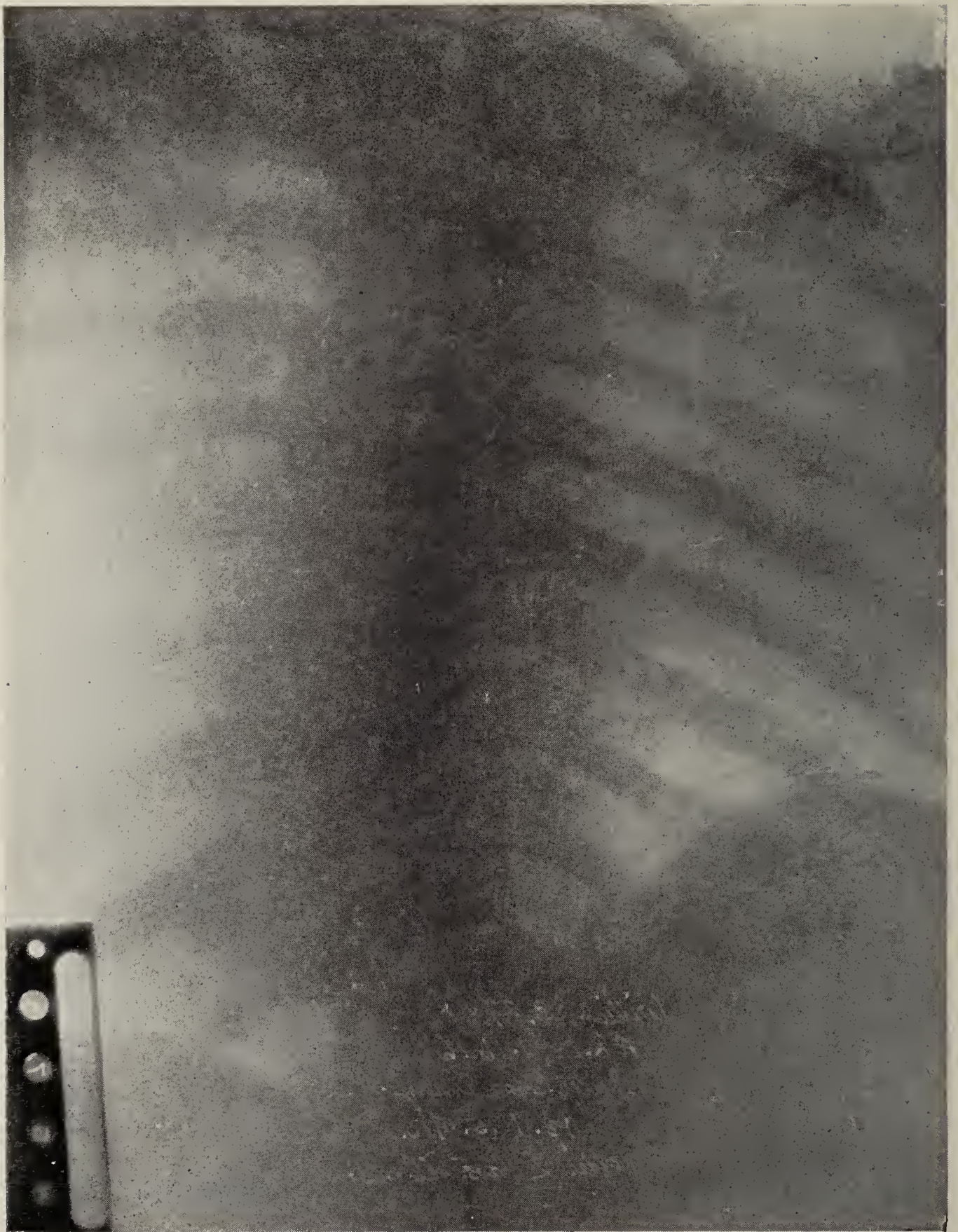


FIG. 94.—Case IX. Empyema encysted between upper and middle lobes of right lung. Note diaphragm on right very much higher than on left; clear lung just above right diaphragm.

January 13. Examined by Dr. Ashhurst. Has been in medical ward over two weeks with sepsis following pneumonia. The right chest is dull from angle of scapula down; vocal fremitus is normal, though voice and breath sounds are diminished; x-ray shows

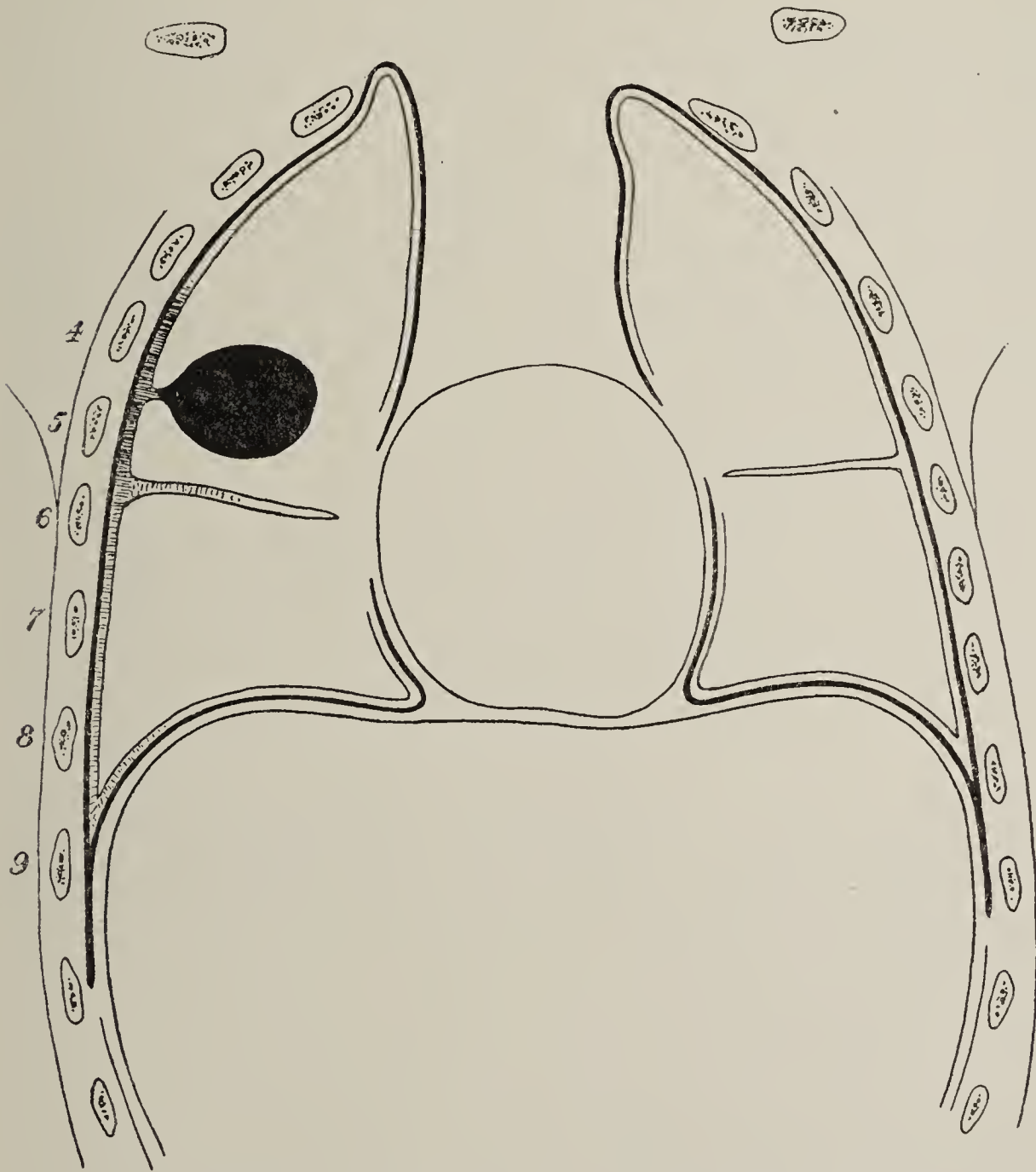


FIG. 95.—Case IX. Empyema encapsulated between upper and middle lobes of right lung. Evacuated by thoracotomy. Compare Fig. 9 (Case VII).

haziness above lower lobe; the latter is comparatively clear (Fig. 94). Exploratory thoracotomy recommended, and patient transferred to surgical service.

January 14. *Operation* (Dr. Ashhurst). Local anesthesia, novocain, 0.25 per cent. Patient prone. Three inches of ninth

right rib excised, posteriorly. On opening pleura, diaphragm and lightly adherent lung presented. Isolating packs introduced above. Lung separated from diaphragm by finger as far as finger could reach, but no pus found. Surface of diaphragm rather sensitive, lung insensitive. Then separated adhesions between middle and lower lobes, but still no pus could be found. The finger burrowing up along costal pleura found very dense adhesions in neighborhood of fifth and sixth ribs, in midaxillary line. When just about to abandon search, finger finally broke through extremely dense adhesions on surface of lung, and a flood (6 to 8 ounces) of pus was evacuated, evidently from between upper and middle lobes (Fig. 95). (Culture of the pus showed pneumococcus). Slight coughing followed evacuation of pus, and partial collapse of the lung occurred. A rubber tube passing up four inches from the eighth rib was left in for drainage.

January 15. Patient looks convalescent.

January 16. Wound drains freely.

January 20. Tube removed.

January 23. Temperature normal. Out of bed. Sputum negative for tubercle bacilli.

January 31. Convalescent.

February 3. No discharge from wound, only small granulating surface. Sent home at own request. (This patient cannot be traced).

In still another case I resorted to exploratory thoracotomy in the face of unproductive punctures and of inconclusive physical signs, but with symptoms of such severe general sepsis that the presence of pus and early death without operative relief seemed certain; and though the abscess was not found at operation, I do not think myself unjustified in claiming that had the skiagraph (made some days after the unsuccessful exploration) been available beforehand, pus would have been located at the time of operation, with every reasonable chance of saving the patient's life by drainage of the abscess.

CASE X.—*Interlobar empyema (left), not found at operation; death.*

Katherine D., aged thirty-eight years, was referred by Dr. Shannon, and admitted to Dr. Ashhurst's service in the Episcopal Hospital, August 3, 1916. Operation, August 5. Death August 13.

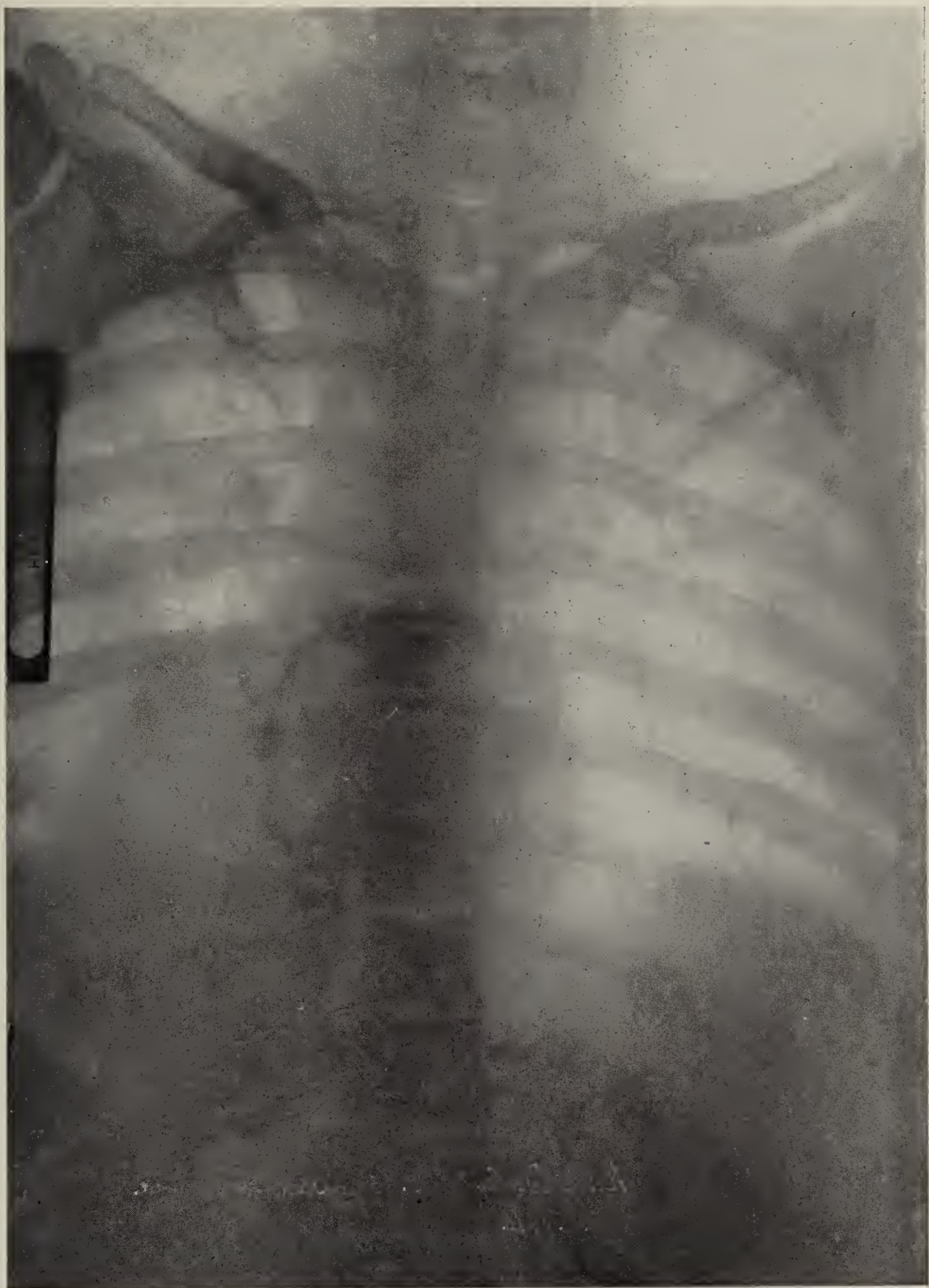


FIG. 96.—Case X. Encysted empyema (six days after operation at which no pus was found). Note distinct outlines of abscess cavity overlying shadows of sixth, seventh and eighth thoracic vertebræ, mostly to left of midline.

Previous History. Four or five years ago had an attack of pneumonia and left sided pleurisy in another hospital for five months, with septic temperature and chills. Was aspirated but no pus was found.

Present Illness. Has had no illness since, until six weeks ago, when she had pain in left side for two days; had severe pain for forty-five minutes followed by a chill. July 28 had temperature 103° , pulse 120; had more chills. August 1 went to bed, complaining of weakness, fever, and pain on left side. Night before admission had pain in right shoulder, relieved by hot compresses. Has had slight cough but not much expectoration. Coughed more before taking to her bed.

Condition on Admission. Fairly well-nourished, no evidence of acute suffering. Breath foul. Temperature 101° to 105° . Pulse 120 to 150. Respirations 32 to 40. Chest: posteriorly, inspection and palpation are negative, except for slight restriction of expansion and decreased fremitus at base of left lung. Percussion note is impaired from seventh interspace in midaxillary line to vertebral column and extending to base of left lung. Auscultation shows decreased breath sounds over this area. The right lung is normal. The heart action is rapid; its outlines are normal, and there are no murmurs. The abdomen is negative. Puncture of the chest in the seventh interspace gave no fluid.

August 4. Had a chill after admission, and another chill today. Temperature varies between 101° and 104° F. The x-ray apparatus is being repaired and no Roentgen examination of chest can be made. This was evidently a case of empyema, perhaps encapsulated, and exploratory thoracotomy seemed justifiable, in view of the patient's gravely septic condition.

August 5. *Operation* (Dr. Ashhurst). Local anesthesia, novocain 0.25 per cent. Patient prone. Incision four inches long over eighth left rib, posteriorly, and three inches of rib resected. On opening pleura lung was found lightly adherent to costal pleura throughout, but not fixed immovably. The lung was densely adherent at its periphery to the diaphragm. Isolating packs were introduced above. The lung was then dissected from diaphragm with scissors and forceps; as soon as the border of the lung was freed by this sharp dissection, the remainder could be peeled off with the fingers. No pus was found here. The spleen was easily palpable through the diaphragm, and there was no evidence of subphrenic abscess. Isolating pack introduced over diaphragm, and upper pack removed. Lung was then separated from costal

pleura as far upward as finger could reach, but no pus was found. The skin incision was next extended cephalad at its vertebral end and one inch more of eighth rib, and four inches of seventh rib were excised. The fissure between the upper and lower lobes of

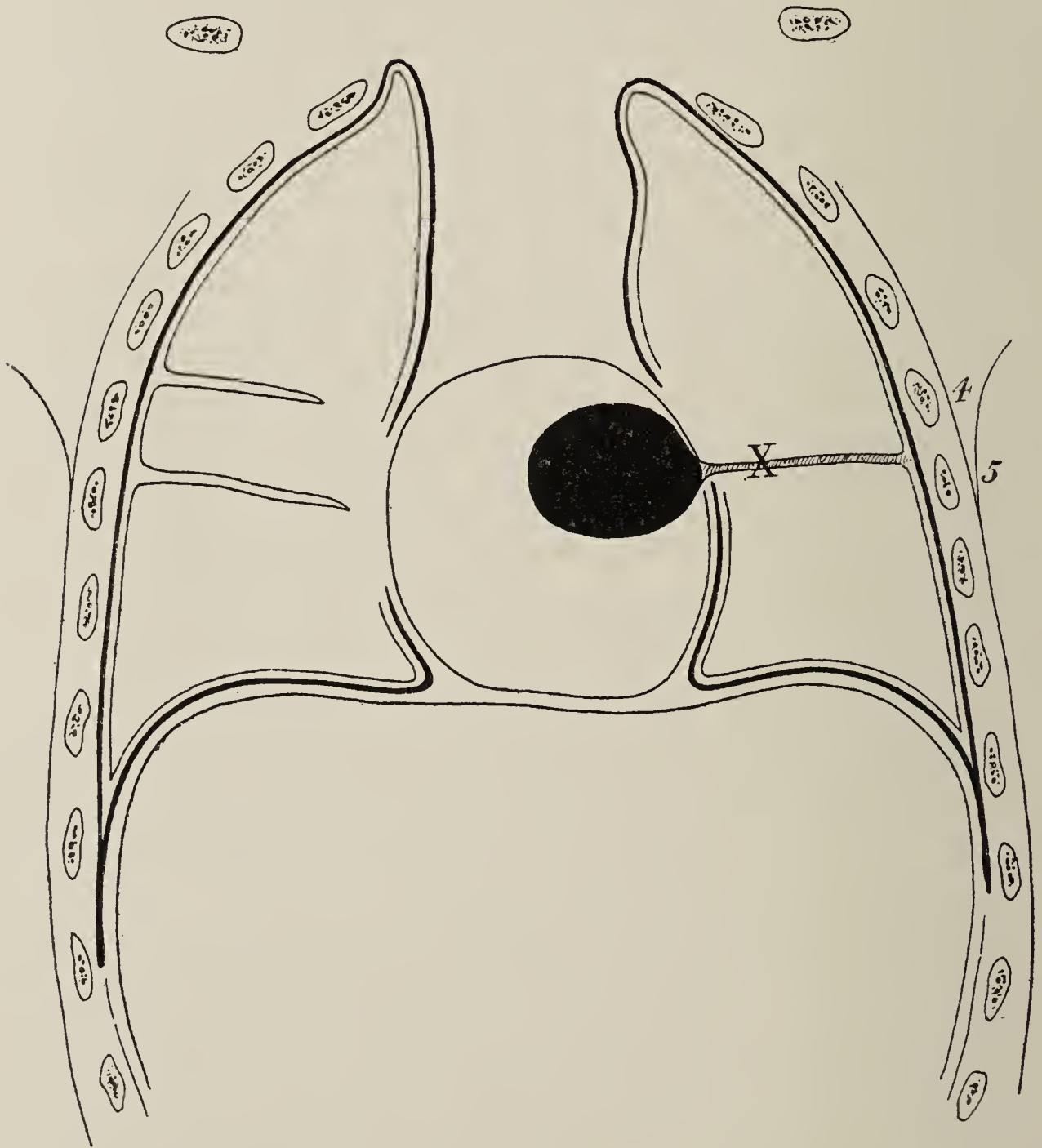


FIG. 97.—Case X. Empyema encapsulated between fissure of left lung and pericardium. X indicates the point reached at operation. See Figs. 96 and 98.

the lung could now be identified, and with two pairs of dissecting forceps the lobes were carefully separated. When the free margins of the lobes had been separated, the adhesions became still more dense, and after pursuing the separation for about three inches

it seemed advisable to discontinue the search for pus. A culture of the blood effused in separating the lobes gave no growth. Hoping the pus, if any were present in this locality might subsequently break into the drainage tract, a strip of iodoform gauze was stuffed into the interlobar space, and the wound was closed in layers.

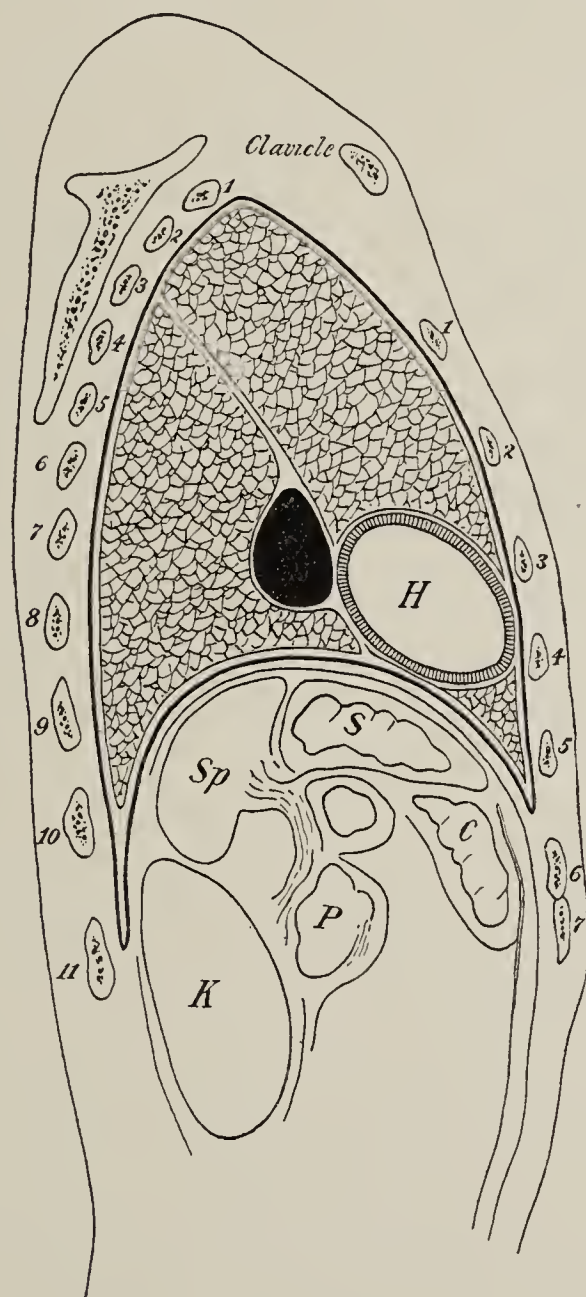


FIG. 98.—Case X. Diagram of sagittal section through middle of left clavicle, indicating site at which pus was found at autopsy.

August 6. Patient seems rather better since operation.

August 7. The blood culture is negative. Had one chill today. Examination by Dr. R. S. Hooker: on left side of chest down to angle of scapula there are normal breath sounds, resonance and fremitus. The surgical dressings prevent examination below this point. Heart: second aortic sound accentuated; no murmurs.

August 9. Drainage removed, and wound clean. Examination by Dr. Hooker: Heart: second aortic sound accentuated, roughening at mitral valve, presystolic. Entire right lung shows increased vocal resonance, many crepitant rales, and impaired note on percussion; a typical pneumonia, evidently hypostatic in origin. The left lung same as last examination.

August 10. Expression is anxious; is usually apathetic, but at times rather restless. Heart sounds are distant. Some evidence of pus on dressings, not present yesterday. Neck is held very rigid, and she moves extremities when attempt is made to flex neck. Temperature does not fall below 101° any more. Leukocytes 19,000, with 79 per cent. polynuclears; hemoglobin, 55 per cent.

August 11. Skiagraph (now first available) (Fig. 96) shows a distinct abscess cavity slightly to left of midline, overlying shadows of bodies of sixth, seventh, and eighth thoracic vertebræ.

August 13. Has been moribund for last three days, and died at 6 P.M. today. Permission for autopsy could not be obtained, but by removal of another rib, the left side of the thorax was fully exposed. On separating the lobes of the lung through very dense adhesions for not more than an inch beyond the spot reached at operation (Figs. 97 and 98), an abscess was found just behind the heart, in front of the spine, corresponding in position to the shadow seen in the x-ray. This abscess contained about a cupful of yellowish pus (3 to 4 ounces); its mesial wall was formed by the pericardium. The pericardium when opened showed inflammatory exudate but no fluid.

In urging resort to exploratory operation of any kind, there are two main factors which must be investigated: (1) The relative innocuousness of the operation *per se*, and (2) the technical difficulty of the undertaking. The former factor affects the patient, the latter concerns the surgeon. It matters not a whit to the patient how much anxiety of mind or labor of body an operation causes to the surgeon, so long as the operation itself is conducted along perfectly safe lines to a triumphant termination. On the other hand, an operation may cause the surgeon no worriment either of body or mind, and yet be very dangerous to the patient. It all depends on the surgeon.

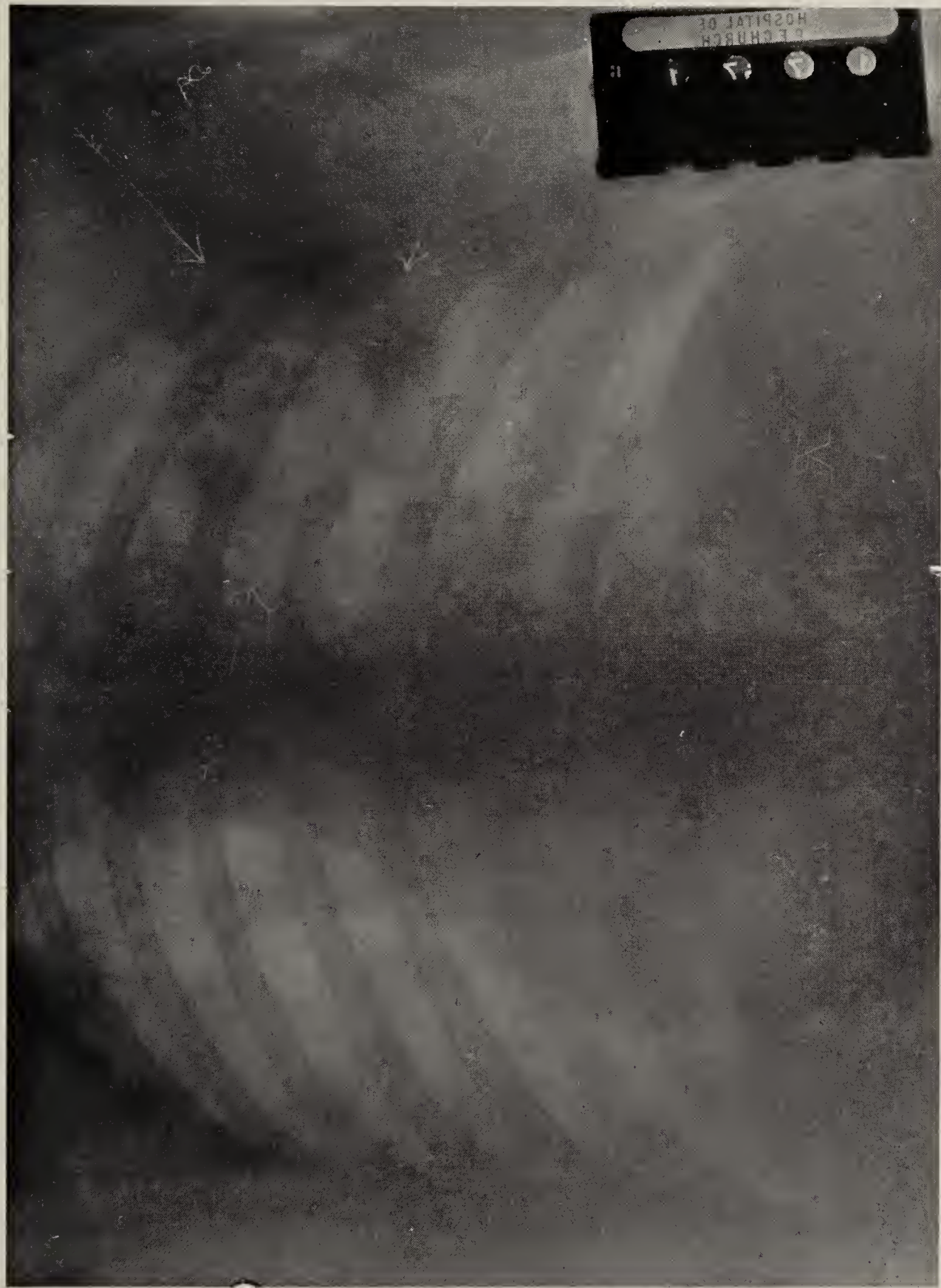


FIG. 99.—Case XI. Abscess in right lung following tonsillectomy (underlies fourth, fifth, sixth and seventh ribs.)

What I desire to emphasize here is that thoracotomy, even when combined with rather extensive intrathoracic explorations, is not necessarily a dangerous operation to the patient, and that with proper technic it is not particularly difficult for the surgeon.

The dangers of an operation are mainly (1) hemorrhage, (2) shock, and (3) infection. In thoracotomy there is no risk of serious hemorrhage. The intercostal vessels usually may be avoided, with care, but if injured are readily ligated. Bleeding from the lung is unusual, and with open pneumothorax can hardly be more than an ooze readily controlled by hot packs. The blood-pressure in the pulmonary system is said to be only one-third of that in the systemic. If hemorrhage is absent there rarely, perhaps never, is shock, especially if the operation is done under local anesthesia as these exploratory thoracotomies should be done whenever possible (and it is usually possible). I have never seen shock attend a thoracotomy done under local anesthesia. Finally, I believe there is no more risk of causing infection than in opening the peritoneal cavity, provided the same care is exercised in attempting to prevent it in one case as in the other. Everyone knows that with proper technic abscesses may be opened and drained across the healthy peritoneal cavity without causing general peritonitis, and the same is true of abscesses within the pleural cavity. Of course if an intraperitoneal abscess is very large, coming in direct contact with the anterior abdominal wall, or with the posterior vaginal wall, or even with the rectal wall, it usually is the part of wisdom to incise it directly, without opening the healthy peritoneum; in such cases the latter course is not necessary, any more than it is necessary to traverse the healthy pleura to open a massive empyema. But in the case of both pleura and peritoneum there is no particular danger in opening remote and limited collections of pus after proper protection of the healthy serous cavity across which exploration is conducted. Even were this danger much greater than it is, it is one that

should not be feared, since it is well known that desperate diseases require desperate remedies.

TECHNIC OF EXPLORATORY THORACOTOMY. The patient is given, about thirty minutes before the commencement of the operation, a hypodermic injection of morphin (gr. $\frac{1}{6}$) and atropin (gr. $\frac{1}{150}$); these doses may be larger in robust adults and smaller in children.¹

The patient is placed *prone* on the table, is made comfortable with pillows, and his head is turned away from the side on which operation is to be done. The arms are placed above the head. Care is necessary to see that the patient lies flat on his abdomen and thorax, and is *not turned on the healthy side*, as this will hinder respiration. I have employed the prone position, as advised by Elsberg, for thoracotomy for many years; it makes readily accessible the whole lateral and posterior surfaces of the thorax, and there is much less tendency for the lung to collapse when the pleura has been opened.

The proposed skin incision is then infiltrated with the local anesthetic,² and the intercostal nerves above and below the rib to be resected are blocked with an injection of about 2 c.c. each of the anesthetic fluid. These nerves are located by making the point of the needle impinge upon the rib above the nerve, and then prodding the rib with the point of the needle until the lower border of the rib is found, when, after pushing the needle about 0.5 cm. further into the intercostal structures the injection is made. This should be at a point about three or four inches from the spinous processes. When

¹ But I believe overcarefulness not to give too large a dose of morphin to a boy of fourteen years (Case VIII)—(only $\frac{1}{12}$ grain was given)—was the only reason that resort to general anesthesia (gas-oxygen) was necessary after the thorax had been entered. Thus far I have not employed local anesthesia under the age of twelve years. (Postscript: At this writing (April 7, 1917) I have operated successfully under local anesthesia on two patients, aged respectively nine and seven years.)

² I prefer novocain, 1 : 400; but since this is no longer available I have been using with satisfaction eucain, 1 : 100, to every ounce of the solution adding two drops of adrenalin chloride solution (1 : 10,000). I have used as much as 35 c.c. of this solution during an operation.

the anesthetic has been properly injected the incision of the soft parts and the resection of the rib may be done absolutely painlessly. If after the pleura has been opened and explored, more room is desired, it is perfectly easy to resect the rib next above or below by (1) infiltrating the skin parallel to the spinal column upward or downward from the posterior end of the primary incision; (2) blocking a third intercostal nerve as already indicated; (3) raising the soft parts in a flap; and (4) resecting (subperiosteally) as much as is required of the next rib. Usually it is not necessary to divide the intercostal structures between the ribs resected, since when the ribs have been removed the intervening soft parts may be drawn aside by retractors. The length of rib to be resected depends on the size of the thorax and the extent of the intrathoracic exploration. As a rule, three or four inches is sufficient.

The pleura is opened between forceps, as the peritoneum is treated. Usually in cases of suspected empyema there is no collapse of the lung, which is adherent to the costal or diaphragmatic pleura. Even if the lung is not adherent it seldom collapses to less than half its bulk, and there is comparatively little respiratory disturbance. Wide opening of the pleura causes less dyspnea than a small and valve-like opening which favors the development of a tension pneumo-thorax.

After opening the pleura, and before conducting any exploration for an encysted empyema, the structures should be inspected. The lung may be so closely adherent to the diaphragm that it will be very difficult to recognize the line of junction. After ocular inspection, which may give a clue as to the first place to be searched for the abscess, the remainder of the pleural cavity should be walled off with hot moist gauze. Then with fingers, dissecting forceps, or even knife or scissors (according to the density of the adhesions), the lung should be gently released. Usually it is well to clear the diaphragm first. If no pus is found here, the packs are re-arranged so as to protect the lower part of the pleural cavity, and a search is begun in the fissures of the lung. If the lung is not readily accessible, its lower lobe is caught in

2 or 3 pair of volsella forceps, and maintained within reach. A single pair of volsella forceps is more apt to tear out and so damage the lung than are two or three simultaneously applied. Fixing the lung in the wound steadies the mediastinum, enables the diaphragm to resume its piston action, and thus ventilates the other lung. The lung is absolutely insensitive to these manipulations. Often it is not necessary to fix the lung in this way, and the surgeon proceeds at once to separate the lobes from each other. Usually where the adhesions are densest, pus will be found.

When pus is finally located, and has been evacuated, a rubber tube surrounded with loose iodoform gauze is placed in the abscess cavity, the isolating packs are removed, and the wound is closed in layers around the drainage tract—the pleura and intercostal structures in one layer, then the skin.

In three cases of suspected empyema I was not able to find any pus at the time of operation. In all I left drainage (rubber tube or iodoform gauze) where the seat of greatest disease seemed to be. In the first patient (Case VII), the empyema ruptured into the wound a week after operation, and recovery ensued; the second patient (Case X) died of sepsis eight days after operation, and the pus was found *postmortem* only an inch distant from the point of drainage. The third case turned out to be one of pulmonary abscess (Case XIV), and here also the pus ruptured into the wound some two weeks after operation.

ABSCCESS OF THE LUNG. In three out of the four cases which I have classed as “abscess of the lung” there was no suspicion that the lesion might be an encysted empyema; in the fourth case the medical diagnosis was empyema, and operation was undertaken under the impression that this was correct; exploration, however, as well as the history of the case, indicated that it was a case of true pulmonary abscess.

It is stated in many text-books, and is taught by many clinicians, that most abscesses of the lung are meta-pneumonic. But unless this statement is further qualified, I am sure that it does not hold good, at least for the cases of abscess of the

lung seen by the surgeon. Of course it is true that suppuration cannot occur in the lung or anywhere else without a preceding inflammation; but it is only in this sense, I believe, that it can truthfully be said that most abscesses of the lung follow pneumonia. They do not, however, follow a lobar pneumonia with any great frequency; the majority, if not all, of such cases which are often called abscesses of the lung are interlobar empyemas which have ruptured into a bronchus (Cases V and VI). True abscess, primary in the lung, is almost invariably due to (1) inhalation of septic matter (vomitus, pus from the cranial air sinuses, etc.), or (2) embolism. Probably most cases are due to the former, embolism usually, though probably not always, causing a diffuse suppurative pneumonitis soon fatal. However, I believe the abscess in Case XIII of the present series was due to the lodgment of a septic embolus. In the other patients whose histories are appended (Cases XI, XII and XIV) the abscesses were undoubtedly due to inhalation-infection.

In many cases, pulmonary abscesses drain well enough through the natural passages. This seemed to be the status of affairs in two patients who were referred to me by their physicians with the possibility of operation in view (Cases XI and XII). In the only two cases (Cases XIII and XIV) in which drainage by the natural passages was not free, and in which I undertook exploratory thoracotomy, the immediate and remote effects of the operation were so beneficial that I should not hesitate to adopt the same procedure in any future cases of this kind.

I shall quote first the two cases in which drainage through the natural passages seemed sufficient, and then two cases in which operation was done.

CASE XI.—*Abscess of upper lobe of right lung following tonsillectomy; no operation; recovery.*

Bessie G., aged thirty-two years, admitted to Dr. Frazier's service in the Episcopal Hospital August 5, 1915; discharged September 3, 1915, recovered.

Previous History. Had an operation elsewhere four years ago for nasal trouble. No symptoms for one year subsequently, but has required constant treatment for last three years.

Present Illness. Tonsils were removed three weeks ago (ether); left the hospital a couple of days after operation. Has not been well since she went home. Felt feverish, Her physician thought she might be getting pneumonia. Two weeks ago she began expectorating large amounts of brownish material. The odor of this was so offensive that people would not come into her room. For the last week she has been in bed. Her physician examined her sputum for tubercle bacilli, but none were found. She had two small hemorrhages from the lung before admission.

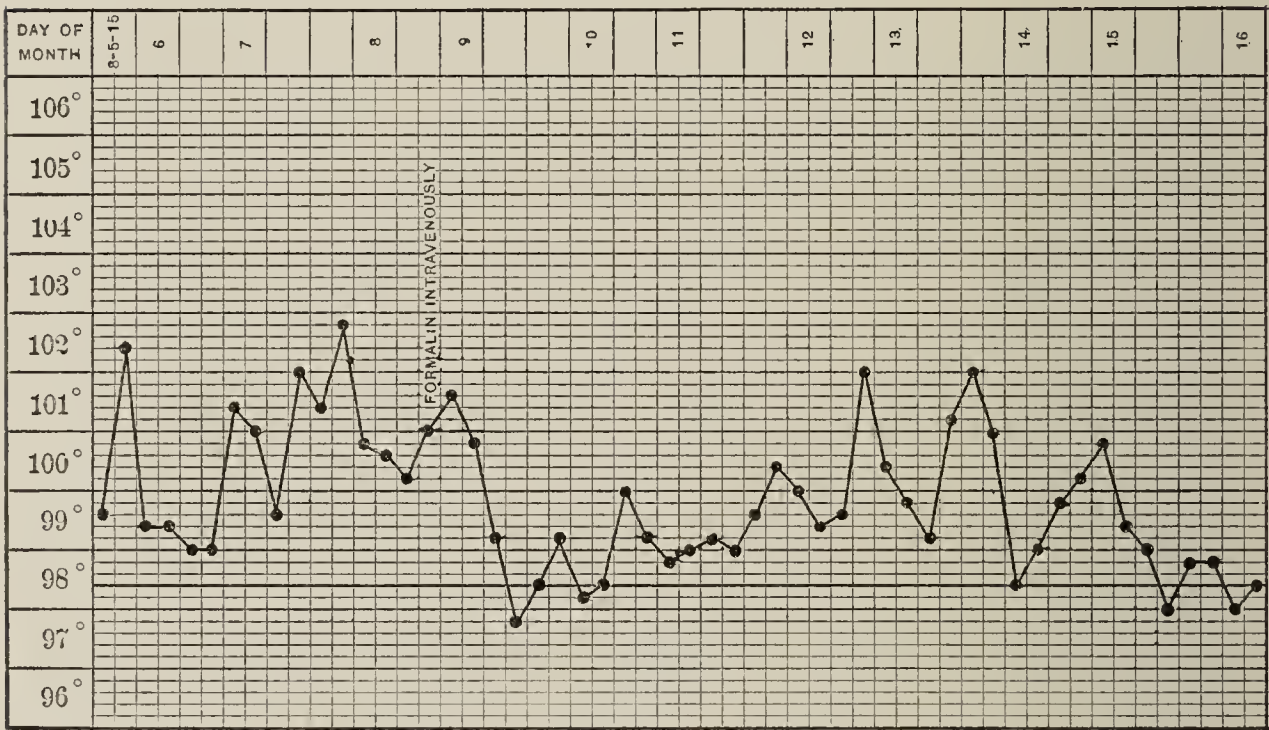


FIG. 100.—Temperature chart of Case XI. Temperature remained normal after August 16.

Condition on Admission. Fremitus is increased on right of thorax above fifth rib. Anteriorly over this area many bubbling rales are heard, and the whispered voice is increased. In the axilla are many crackling rales. The remainder of the right lung, and the left lung are negative.

August 6. Leukocytes 17,760, with 86 per cent. polynuclears. Expectorates a very large amount of yellowish thick foul smelling material each day. Had several very bad attacks of coughing last night.

August 7. Sputum negative for tubercle bacilli. Skiagraph shows abscess cavity underlying shadows of the fourth to sixth right ribs (Fig. 99). Temperature varies from 101° to 102° F.

August 8. Given 1.5 c.c. of formalin in one pint of normal saline solution intravenously, by Dr. M. P. Young. During its administration lacrymation became marked, face became somewhat cyanotic, and odor of formaldehyde was noted in her breath.

August 9. Temperature has fallen rather abruptly to normal.

August 12. Temperature has risen gradually to 102° F.

August 13. Temperature is still up to 102° F.

August 14. Given oil of eucalyptus 5 drops, three times daily in plenty of water. Sputum about 7 ounces daily. Elastic fibers present.

August 16. Temperature has reached normal, and never afterwards rose at all (Fig. 100).

August 22. No rales can be heard.

August 26. Out of bed.

September 3. Went home, cured.

CASE XII.—*Abscess of lower lobe of left lung, from aspiration of food; no operation; recovery.*

Charles W., aged seventeen years; seen at the Orthopædic Hospital in consultation with Dr. Charles W. Burr. Admitted August 31, 1915; discharged October 5, 1915, recovered.

Present Illness. Three weeks ago drank two bottles of soda water, one cream, and one lemon; half hour later became very sick, vomited a great deal, had intense pain in stomach and diarrhea. Was sick all night, but seemed to have recovered the next day. On evening of August 23, after eating supper (during which he swallowed his food normally) he drank from a running hydrant in the street, and the water came out of his nose. The next morning at breakfast he could not swallow well, and his speech was thick. He has lost twenty pounds in weight since onset of illness one week ago; now weighs 110 pounds. For the past two days his cough has bothered him constantly, with considerable substernal pain and oppression. He expectorates almost constantly large quantities of yellow frothy purulent matter. His temperature is 102° to 103° F.

Condition on Admission. Examination by Dr. Leavitt: in bed, very weak and languid. Coughing constantly, very loose; purulent expectoration. Tongue coated, breath foul. Tongue movements slow and cumbersome, but can move tongue weakly in all directions. Soft palate relaxed and edematous, but no paralysis. Left chest posteriorly is dull up to angle of scapula; absent breath sounds, decreased vocal and tactile fremitus. Right chest is normal. Puncture below angle of left scapula gave seropurulent fluid, which showed a few Gram-negative diplococci, very few streptococci, and a few isolated endothelial cells; cell count of this fluid, showed 64 per cent. polynuclears.

September 3. Examination by Dr. George B. Wood: considerable mucopurulent material coming from trachea; nose and throat otherwise negative. No paralyses.

September 3. Examination by Dr. Ashhurst: spinal column is normal. Impaired resonance at base of left lung, posteriorly, but no impairment of tactile fremitus; breath sounds distant but audible. No empyema, but abscess of lung. Advised oil of eucalyptus, five drops three times daily, with morphin and atropin p. r. n.

September 4. Dr. E. P. Corson-White reports on sputum: no tubercle bacilli, no blood streaks; elastic tissue present but scanty. Gram-negative diplococci and streptococci.

September 5. Dr. Ashhurst: Consolidation and tubular breathing at left base, posteriorly. Temperature normal. Expectoration lessening, and not so frothy.

September 8. Dr. Ashhurst: Impaired resonance, but no tubular breathing; breath sounds audible throughout lung.

September 10. Dr. Ashhurst: Percussion note normal all over. Dr. Burr still thinks origin of trouble was aspiration of food particles due to neuritis of esophageal nerves following ptomain poisoning.

September 15. Convalescence from this time was uneventful.

October 5. Went home.

Amounts of daily expectoration:

Sept. 6.	16 ounces.
7.	22 ounces.
8.	13½ ounces.
9.	21 ounces (includes some vomited ice cream).
10.	15 ounces.
11.	9½ ounces.
12.	14 ounces.
13.	11 ounces.
14.	8 ounces.
15.	13 ounces.
16.	9 ounces.
17.	7½ ounces.
18.	5 ounces.
19.	4 ounces.
20.	2½ ounces.
21.	2½ ounces.
22.	2 ounces.
23.	2 ounces.
24.	½ ounce.

CASE XIII.—*Appendicitis with diffuse peritonitis; abscess of lung two weeks after removal of appendix; exploratory thoracotomy one week later; recovery.*

Charles S., aged eighteen years, was admitted to Dr. Frazier's service in the Episcopal Hospital September 22, 1913. Appendix removed same day. Signs of lung abscess October 3. Exploratory thoracotomy October 10. Laparotomy for intestinal obstruction October 22. Discharged November 8, 1913, recovered.

Present Illness. Began September 18, 1913, with sudden severe abdominal pain; bowels have not moved since. Pain lessened on September 19 and 20, and was absent on January 21, but this morning (9 A.M.) recurred with greater severity. Continued at work until today.

Condition on Admission. Temperature, 101° F.; pulse, 120 to 140; respirations, 28 to 40. Leukocytes, 32,000, with 88 per cent. polynuclears. Lies on right side with thighs flexed; alæ nasi play in respiration. Is evidently in great distress. Forehead covered with sweat. Chest is normal. Abdomen presents very marked board-like rigidity all over, such as is commonly seen in cases of duodenal perforation. It is not distended. There is very acute tenderness in the epigastrium and down right lumbar region to right iliac fossa. Most acute tenderness is one and a half inches above iliac crest. The right iliac region is dull, the left is tympanitic. Peristalsis is inaudible. Diagnosis: peritonitis, probably from duodenal perforation.

September 22. *Operation* (Dr. Ashhurst) at midnight, immediately on admission (ether). Incision in right rectus gave exit to free pus (smear and culture showed a mixed infection). No perforation in stomach or duodenum. Evidence of large ruptured abscess in right loin. Appendix found here, large and necrotic; removed. Small suprapubic incision made and glass tube passed to pelvis; free discharge of pus. Drainage: glass tube to pelvis, and gauze wick through upper wound to right loin.

September 26. Temperature at last normal. Glass tube removed.

September 28. Temperature rising.

September 29. Gauze from upper wound removed.

October 3. Coughs a little, causing some distress. Lungs negative. Temperature has run from 100° to 102° F. since September 30.

October 4. Coughed up considerable quantity of foul smelling pus last night. Temperature 102° F.

October 5. Last night coughed up 5 ounces of very fetid pus.

Had to be isolated on account of odor. At midnight he vomited fecal (?) material. Sputum is negative for tubercle bacilli; it contains a few tissue fibres. Leukocytes, 18,240, with 81 per cent. polynuclears. Seen by Dr. Fussell in consultation: heart not displaced. Base of left chest distended, does not move in respiration; dulness posteriorly up to midscapula, laterally up to fifth rib. At angle of left scapula is marked pectoriloquy and amphoric breathing, and large moist rales. Blowing not evident on quiet breathing. Slight fremitus over right base.

October 6. Patient also examined by Dr. R. S. Hooker, who again found signs indicating abscess of lung. Dr. Hooker thought it probably was due to inhalation of septic matter. Dr. Fussell agreed with Dr. Ashhurst that it probably was embolic. Dr. H. C. Deaver thought it was a case of subphrenic abscess rupturing through a bronchus.

October 7. Coughed up 2 ounces of pus last night.

October 8. Coughed up 2 ounces of pus last night.

October 9. Dulness about left base has somewhat decreased. Needle in eighth interspace drew a few drops of same pus as is being expectorated.

October 10. Temperature last night rose to 102° F. As no improvement seemed to occur, exploratory thoracotomy was decided on.

October 10. *Operation* (Dr. Ashhurst). Local anesthesia, eucain 2 per cent., with a few whiffs of oil of orange and ether after opening pleura. Patient prone. Resected one and a half inches of ninth left rib in posterior axillary line. Costal pleura thickened, and adherent to adjacent diaphragm. Lung not adherent to parietal pleura nor to diaphragm. No pus in pleura. Lung felt soft, no signs of abscess. Diaphragm felt normal and moved freely in respiration. Wound closed without drainage.

October 11. Spits up very little pus (too small quantity to measure), and had a very good night. Temperature 98° to 100° F.

October 16. Temperature has been normal since operation until today when it rose to 101° (Fig. 101).

October 19. Pain in lower abdomen. Bowels open as usual.

October 20. X-ray of lung shows no abscess visible. Periodic attacks of abdominal pain continue, threatening obstruction.

October 21. Still threatening intestinal obstruction.

October 22. Dr. Fussell again examined the chest: left lung much better than before; no signs of cavity. Has not coughed much today. *Operation* today (Dr. Ashhurst) for intestinal

obstruction: kinks found and relieved. After operation temperature fell to normal and never rose again; convalescence was thereafter uneventful.

October 29. Out of bed.

November 2. Up and about.

November 8. Went home, recovered.

Postscript. In July, 1915, Dr. E. G. Alexander at the Episcopal Hospital had to operate again for acute intestinal obstruction, resecting some small bowel for gangrene. Patient recovered, and is now in good health.

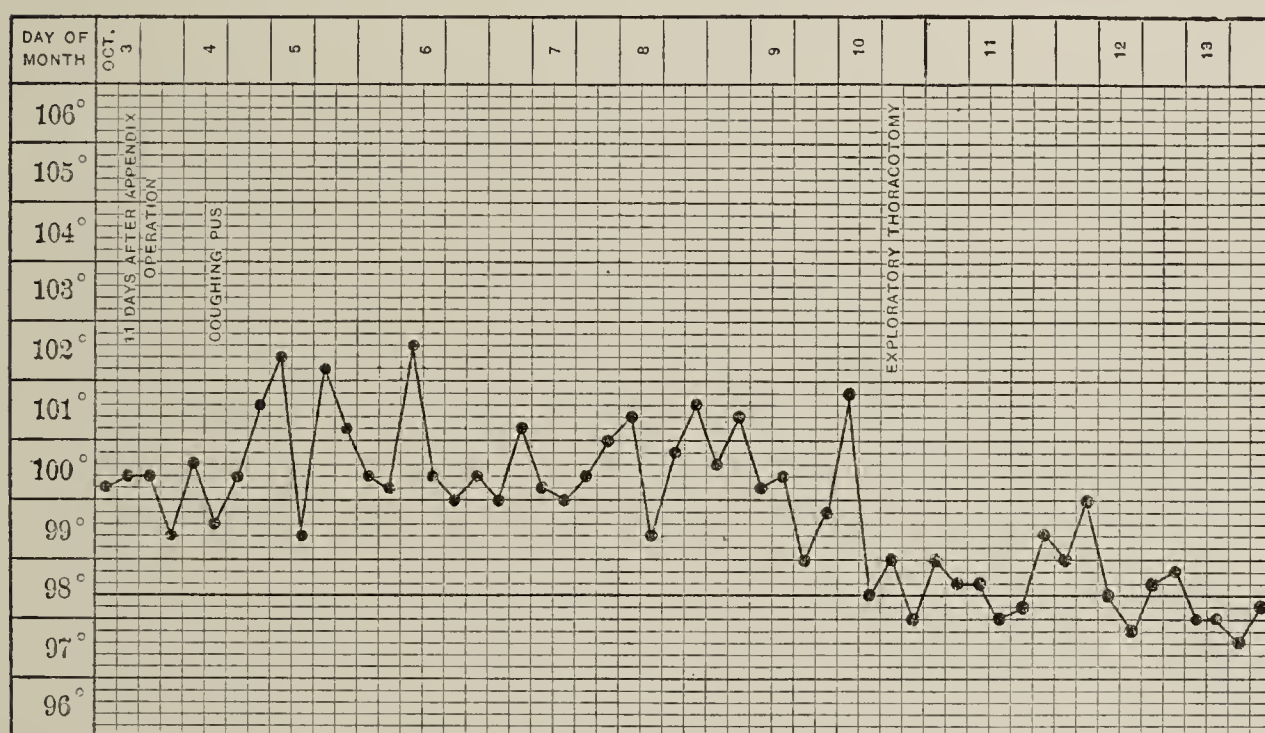


FIG. 101.—Case XIII. Abscess of lung two weeks after appendectomy (diffuse peritonitis). Note effect of operative pneumothorax on temperature, even though abscess was not located.

CASE XIV.—*Abscess of lower lobe left lung; exploratory thoracotomy and drainage; rupture of abscess into drainage tract; ultimate death.*

Frank L., aged forty-one years, admitted to Dr. Robertson's service in the Episcopal Hospital August 18, 1916. Transferred to Dr. Ashhurst's service for operation August 24, 1916. Died October 8, 1916.

Previous History. Patient is an Italian laborer, and there is nothing in his previous history bearing on his present illness.

Present Illness. His chief complaint is paroxysmal attacks of dyspnea; these began about six weeks ago, with a gradual onset of

shortness of breath, which at times was severe. He has been wheezing and coughing, and spitting up a "good bit" of sputum. His voice has been husky, and at times has been unable to speak.

Condition on Admission. Expansion of thorax is fair, but somewhat limited on left, and the left chest seems to bulge slightly. The left chest shows anteriorly impaired resonance, and diminished vocal fremitus; both sides of chest anteriorly show rough and harsh breath sounds, with some hard whistling rales. Posteriorly the breath sounds are very harsh over both lungs but are difficult to hear because of noise of mucus in air passages. The apex beat of the heart is neither visible nor palpable; but the heart is normal to percussion and on auscultation.

August 19. Still has severe paroxysms of dyspnea.

August 20. Improving; attacks are fewer and intervals between them are longer. Becomes very cyanotic in attacks of coughing, and these prevent sleep.

August 21. Much improved. Sputum is negative for tubercle bacilli, Curschmann's spirals, and Charcot crystals. In left axilla and posteriorly expansion is restricted, there is bulging and widening of interspaces, impaired resonance, diminished vocal fremitus and diminished breath sounds.

August 22. Temperature continues septic. Leukocytes, 21,760, with 89 per cent. polynuclears. Examination of cranial sinuses by Dr. Eves (incomplete because of patient's condition) failed to localize any definite sinusitis, though it was suspected. Skia-graphic examination was unsatisfactory.

August 23. Complains of pain in left axilla. A syringeful of pus was drawn by puncture in the sixth interspace in the mid-axillary line. Culture of this pus gave no growth; no tubercle bacilli were present; the fluid was definitely pus. The patient expectorates much sputum, which on standing separates into three layers, the bottom being thick and cloudy, the middle clear, and the upper frothy.

August 24. Transferred to Surgical service, with diagnosis of empyema. Temperature still septic. Breathing is labored, and there is considerable coughing, especially if patient attempts to lie on right side. Expectoration is very foul and profuse. Examination of chest shows hyperresonance at left base, with vocal fremitus, tactile fremitus, and breath sounds distant, *i. e.*, pneumothorax following diagnostic puncture yesterday. Leukocytes, 29,000.

August 25. *Operation* (Dr. Ashhurst). Local anesthesia, eucain 1 per cent. Patient prone. Resected over three inches of ninth

left rib, and opened pleura, which contained neither air nor fluid. Lung not adherent, and collapsed to half normal volume. Then over four inches of eighth rib were resected, but intercostal tissues were not divided. Hot moist pack inserted over diaphragm, and lower lobe of lung drawn into wound by volsella forceps. The lung could be exteriorized for a distance of half an inch. The lobes of lung were adherent to each other, but there were no adhesions to parietal pleura. The lobes could be separated rather easily by the fingers, which entered fissure for three and a half to four inches. The upper lobe felt normal. No pus was found, but there was a patch of inflammatory lymph on the upper border of lower lobe in axillary line. The lower lobe in axillary region felt consolidated, but several punctures, with suction by Luer syringe, discovered no abscess. During these manipulations the patient at times had paroxysms of dyspnea, and expectorated pus freely, but there was no shock, and the pulse always remained good, as could be ascertained by placing the fingers against the pericardium. No subjective sensations seemed produced by palpating the lung, by drawing it into the wound with volsella forceps, by puncturing it, or by passing the hand over the diaphragm (in other patients the diaphragm generally has been quite sensitive, at least near its costal attachments). A retractor which came in contact with the parietal pleura caused pain, so it was withdrawn. A large strip of iodoform gauze was placed in the interlobar fissure, in the hope that the abscess (of whose existence there seemed no reasonable doubt) would rupture into the drainage tract thus formed. This emerged at the posterior angle of the wound, which was closed in three layers. Time of operation, forty minutes.

August 26. Patient very comfortable, cough much less. Expectoration not nearly so foul. Can lie on sound side with not nearly so much discomfort.

August 28. Culture from drainage tract shows staphylococcus aureus. Leukocytes 16,800, with 86 per cent. polynuclears.

August 29. Only serous drainage. Marked improvement in temperature curve since operation (Fig. 102).

August 31. Gauze drain removed; slight discharge of bloody fluid; smear shows staphylococci and short chains of cocci.

September 1. No discharge from chest. Leukocytes 9280, polynuclears 78 per cent.

September 4. Expectorates only about 7 ounces of pus daily. Rubber tube passed into pleural tract drains only serous fluid.

September 7. Still only serous discharge. Wound healing normally.

September 8. No drainage.

September 11. More cough for last two days. When he coughs a little thin pus escapes from sinus. Free discharge of pus on inserting hemostat into sinus. General condition is excellent: temperature regular, not above 100° , respirations 22 to 28, compared with septic temperature, averaging 102° , and respirations 36 to 40 before operation. Eats and sleep well.

September 16. Very little drainage since last note; tract closing. About ward on wheel chair.

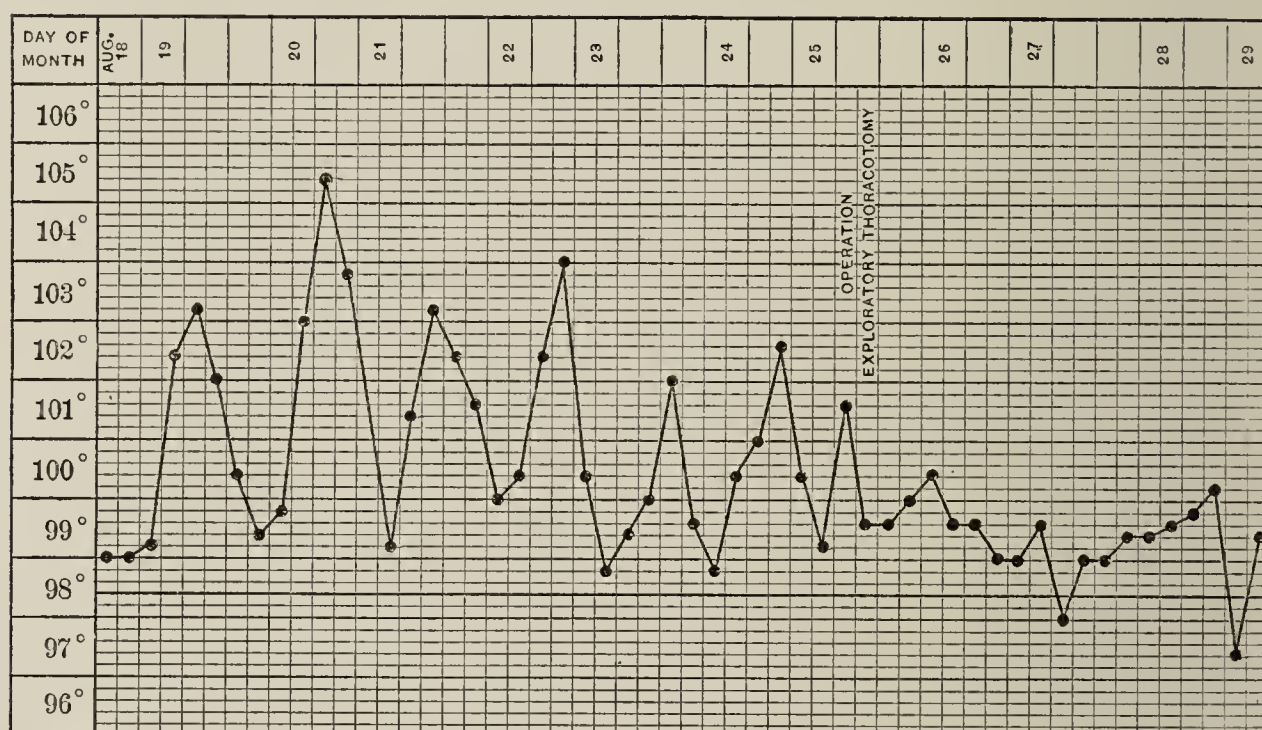


FIG. 102.—Case XIV. Abscess of lung. Note effect on temperature of the operative pneumothorax; abscess ruptured into drainage tract seventeen days after operation.

September 26. Because of rise of temperature for last few days, and increase in expectoration, the wound was reopened, and about 4 ounces of pus evacuated from above diaphragm. Rubber tube drainage.

October 8, 1916. No discharge from wound since last note. Has again become subject to severe asthmatic attacks, with free expectoration of frothy mucus—no pus ever. In one of these choking attacks died suddenly tonight at 8 P.M.

Postmortem examination showed left pleural cavity obliterated by adhesions, no pocket of pus anywhere, upper lobe of lung normal; lower lobe presents some atelectatic areas, but no abscess or cavity. There is an extremely acute diffuse bronchitis. Evi-

dently the abscess in the lower lobe had discharged partly through the bronchi and partly through the drainage tract, and healing was complete at time of death, which resulted from dilatation of the heart superinduced by asthmatic attacks.

The interesting point in these two operative cases of pulmonary abscess, as also in Case X, is the immediate and strikingly beneficial effect of the operative pneumothorax. The temperature at once fell and became regular even though no pus was found or drained. In Case X, in which no outlet for the pus occurred, death eventually ensued from sepsis; but in both Case XIII and Case XIV, the sputum, which before operation had been profuse and exceedingly foul, almost at once became markedly reduced in amount and soon lost its fetor. As in Case XIII the pleural opening was closed without drainage, it may be thought that equal benefit might have been derived from a therapeutic pneumothorax produced by the method of Forlanini, by the introduction of gas through a hypodermic needle. This measure proved of benefit in cases reported by Leuret (*Gaz. Méd. de Paris*, 1915, lxxxvi, 71) and by Greer (*Jour. Am. Med. Assn.*, 1916, lxvi, 1019). But the objection to this method in cases such as these is that it is a blind and uncertain measure, no more efficient than an operative pneumothorax in producing collapse of the lung, and in every way less desirable in that it offers no opportunity to search for the abscess and to provide for external drainage if the abscess can be located. The production of a therapeutic pneumothorax by Forlanini's method has the additional disadvantage of being inefficient if there are adhesions anywhere between the lung and parietal pleura, as in Case V; but the existence of such adhesions cannot be determined without opening the thorax. Not only may an operative pneumothorax be produced under local anesthesia without any inconvenience to the patient but it permits ocular inspection and digital palpation of the diseased lung. It is then possible, if nothing indicating drainage of the pleura is detected, to close the incision leaving the lung col-

lapsed, as in Case XIII; or, if a suspected area is located, as in Case XIV, to provide for eventual drainage of the pus.

SUMMARY. I have endeavored to show:

1. The frequency with which encapsulated and especially interlobar or supra-diaphragmatic empyemas are overlooked, owing to the uncertainty of physical signs and the difficulty or even impossibility of locating pus by the exploring needle.

2. The sanity of exploratory thoracotomy, with direct treatment of the focus of suppuration.

3. The safety of this procedure under local anesthesia, with, if necessary, the opening of abscesses across the healthy but properly protected pleura.

4. And finally, that these principles may be applied to abscesses of the lung as well as to cases of encapsulated empyema.

STRANGULATED RETROPERITONEAL HERNIA INTO THE PARADUODENAL FOSSA; OPER- ATION; DEATH ON THE NINTH DAY¹

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RETROPERITONEAL hernia is rarely encountered on the operating table. Up to 1897, Moynihan could find only fifty-seven cases on record of the variety into the left duodeno-jejunal fossa (to which type the present case belongs), the majority of these having been accidentally found at autopsy, and occurring independently of the disease producing death. Coley, in Keen's *Surgery* (vol. iv, 1908, p. 102), says only 10 successful cases of operation have been reported, nine of left and one of right duodenal hernia.

It is not an uncommon occurrence to have two or more of these retroperitoneal fossæ present in the same individual, so that it is difficult to give an accurate description of their boundaries. The folds which form the boundaries are formed in the fetus by the fusion of the left surface of the primitive mesentery of the duodenum with the right surface of the descending mesocolon, and become accentuated by traction made upon this line of fusion by the eventual drifting of the duodenum to the right and of the descending mesocolon

¹ Reprinted from Am. Jour. Med. Sc., 1917, cliii, 5,

toward the left. The fossa which became the seat of hernia in our case, and which is most frequently involved in cases of duodeno-jejunal hernia, is known as the paraduodenal fossa or fossa of Landzert (1872). The fold producing it results from the presence of the inferior mesenteric vein, for which the fold acts as a mesentery. This vein, passing upward from the mesorectum, verges toward the midline on its way to empty into the splenic vein, and in most cases runs entirely retroperitoneally, not raising any fold or reduplication of the peritoneum. When, however, this fold, or *plica venosa* as it is called, is present, it consists of a vertical and a horizontal portion, the vertical being to the left of and below the fossa and the horizontal bounding the fossa above. The lower boundary of the fossa is completed by a serous fold, the mesenterico-mesocolic fold, which runs from the left side of the jejunal mesentery downward and a little laterally to the right side of the upper mesosigmoid. To the mesial side of the paraduodenal fossa is the root of the mesentery. This paraduodenal fossa, then, is situated to the left and some distance away from the ascending limb of the duodenum (Fig. 103). Posteriorly it is bounded by the peritoneum covering the psoas muscle, the renal vessels, the ureter, and a portion of the left kidney. Its orifice looks downward and to the right, its cavity upward and to the left. The width of its orifice depends on the distance of the inferior mesenteric vein from the duodeno-jejunal flexure.

The causes of these herniæ are similar to those which produce other types. The presence of a deep fossa, with tense margins, and intestines which are freely movable, predisposes to the development of such a hernia. Under such circumstances a coil of intestine may be forced into the fossa by violent peristalsis, or by the sudden increase of intra-abdominal pressure which follows crying in infancy or sudden strains in adult life. The hernia may develop almost at any age. Moynihan mentions a case in a child aged fourteen days; and in herniæ which first cause symptoms in adult life, as in

our own patient, a man, aged forty-seven years, it is often impossible to know how long the condition may have existed without causing any symptoms.

In most cases the previous history is negative, though as in the present case, there may have been previous attacks of abdominal pain, generally ascribed to "indigestion." The

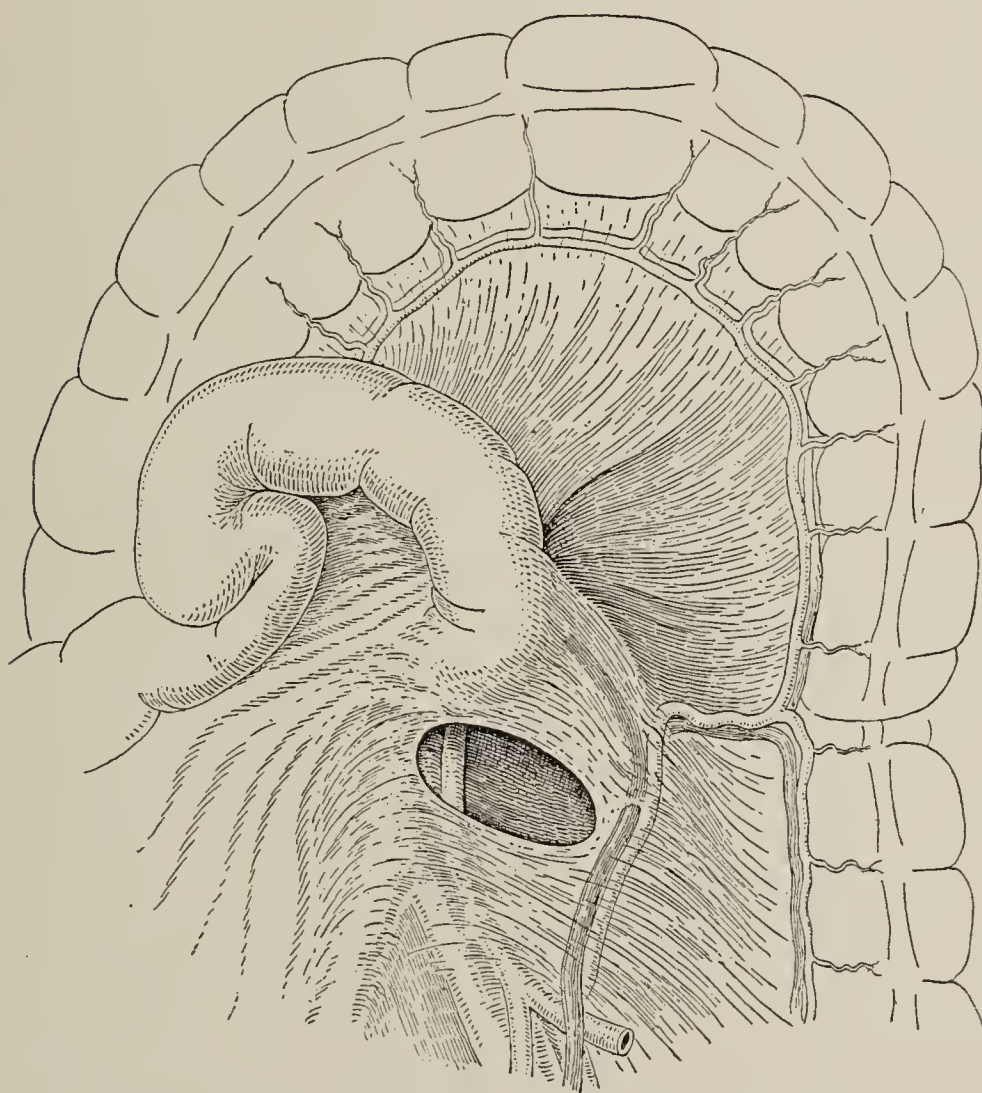


FIG. 103.—The paraduodenal fossa or the left duodeno-jejunal fossa. Note the inferior mesenteric vein and the left colic artery near the left border of the fossa. (After Poirier and Charpy.)

symptoms of strangulation are merely those of intestinal obstruction, and frequently the patient is not seen until peritonitis has developed. If the patient be seen early, the physical signs probably are more reliable than the symptoms. While the size of these herniæ varies considerably, they usually are of sufficient size to produce a circumscribed globular

fulness which when small is located slightly above and to the left of the umbilicus. When they attain their maximum size, however, they may occupy one-third of the abdominal cavity. The prominence formed by the hernia is then especially noticeable in contrast to the flatter area to the right occupied by the ascending and transverse colon and by the few remaining coils of small intestine not involved in the hernial sac. In this respect they may resemble those cases of intussusception which present Dance's sign. Sometimes, as the hernia increases in size, it may be discovered on palpation, or borborygmi and subjective symptoms may point to the region of the abdomen involved. To palpation the mass may have either a doughy or a cystic feel, but no wave of fluctuation can be obtained. The statement made by Moynihan, that the tumor always yields a sonorous note on percussion and clear intestinal sounds on auscultation, no doubt may be true in nearly all cases seen early, particularly when no strangulation is present; but in our own patient all intestinal sounds were absent, owing to beginning peritonitis, and the percussion note was dull, which may be explained by the presence of free fluid outside of the hernial sac and by the accumulation inside the intestines within the sac of three enemas which had not been expelled.

Other physical signs which are said to occur are the presence of hemorrhoids from obstruction of the inferior mesenteric vein in the neck of the sac, and also a dilatation of the superficial abdominal veins serving as anastomosis between the epigastric and mammary.

On opening the abdomen a large globular mass is seen, situated to the left of the lumbar vertebræ. This mass is neither cystic nor hard and nodular, but is doughy in consistency, and the coils of intestine can be palpated beneath the smooth peritoneal covering of the sac. The colon retains its normal relationships, with the exception of the descending portion, which is pushed far to the left side. The entire small intestine may be within the hernial sac, in which case

the only coil emerging from the sac is that nearest the cecum. Some cases have shown coils of small intestine to enter and to leave the sac, thence to reënter and again to leave it. The case herewith reported showed a few coils of upper jejunum lying outside the sac, while the duodenojejunal flexure itself, and all the rest of the jejunum and the ileum, to within a few inches of the cecum, formed the contents of the hernial sac. The loops of intestines lying outside the sac, if there be obstruction, as in our own case, will be much distended; and after strangulation has existed for a number of hours, free abdominal fluid will be present.

The most plausible explanation for the enormous size of some of these herniæ is that the lower portion of the gut is the first to enter the sac, and that the remainder of the intestinal tube is carried into the sac by peristalsis, just as in an intussusception the intussusceptum is carried into the intussusciens. If the orifice of the sac be large, and if peristalsis be violent, portions of the interned gut may be forced out from time to time; or perhaps several widely separated loops of intestine may be involved from the beginning. Either of these factors would explain the condition where portions of gut are seen to enter, leave and again enter the sac. It therefore follows that in reducing these herniæ at operation, traction should be made on the highest portion of gut involved, as it will be found this has been the last to enter. It also follows that the lowest portion of bowel involved is most apt to be the seat of strangulation; although this may arise at any part from the presence of adhesions or kinks, or from constriction at the orifice of the sac.

The enormous size of some of these herniæ has already been mentioned. Cases measuring as little as 1.5 by 2.5 cms. are on record, while others have been reported measuring 14.5 by 24.5 cms., the larger measurement being in the longitudinal axis of the body. In the present case no accurate measurement was possible; but it is sufficient to say that the sac appeared the size of a football, and filled about one-third

of the entire abdominal cavity. These herniæ spread upward into the transverse mesocolon, outward toward the descending mesocolon, or outward and downward, as in the present case.

The sac may be described as a pocket in the peritoneum. It consists of a single layer of peritoneum in itself: the posterior surface rests upon the retroperitoneal structures, while the anterior layer lies in contact with the posterior surface of the posterior parietal peritoneum, giving us two peritoneal layers anterior to the contents of the sac. The orifice of the sac, like the hernial mass, varies greatly in size. In the recorded cases the breadth has measured from 3.5 to 6.5 cms., and the length from 1.5 to 13 cms. In our case the diameter of the orifice was about 5 cms.; after incision of the constricting margin it was easy to introduce the entire hand into the sac.

In the treatment of these herniæ it is especially important to bear in mind the structures which run in the anterior wall of the sac, at or near its free margin, namely the inferior mesenteric vein and the left colic artery. It is often necessary to relieve the strangulation before the hernia can be reduced; and when the vein lies close to the orifice the only place at which an incision can be safely made is at the lower border of the constriction, in the mesenterico-mesocolic fold, keeping to the mesial side of the vein. In all cases, careful palpation should be made for the location of these vessels, and injury to them avoided. After relief of the strangulation, the hernia should be reduced as described above beginning with the uppermost loop of intestine. After reduction the intestines are to be treated as in other cases of strangulated hernia. Finally attention must be paid to the retroperitoneal sac, which will predispose to a recurrence of the hernia if nothing is done to prevent such a sequel. The simplest method of disposing of the sac is to close its orifice by sutures, sewing the free anterior margin to the posterior parietal peritoneum which covers the psoas muscle, etc. This is what was done

in our case, owing to the poor condition of the patient. There are, however, two objections to this procedure; the first was shown in our case at autopsy ten days after operation, when the suture of chromic catgut was beginning to be absorbed, and the two peritoneal surfaces had not become tightly adherent, thus opening a way for a recurrence of the hernia. The second objection is the danger of cyst formation in this walled off sac. The operation of choice, therefore, though only applicable when the patient's condition warrants a rather prolonged operation, is to excise the entire sac, and then to suture the remaining two edges of peritoneum. In either operation the inferior mesenteric vein is constantly in danger of injury. And though its division and ligation, or even a similar treatment of the ascending branch of the left colic artery, might not entail a fatal result, injury to either would subject the patient to much risk, and considerably complicate the operation.

CASE HISTORY. Arthur C., aged forty-seven years, a laborer by occupation, was admitted to Dr. Frazier's service in the Episcopal Hospital, Philadelphia, September 25, 1915. Discharged October 6, 1915 (died).

Family History. Negative.

Previous History. For years the man has had attacks of cramp-like pain in the upper abdomen. One especially severe attack occurred about eight years ago, but he recovered without operation. These attacks seem to occur more frequently after eating steak or crabmeat. Vomiting occurs and is followed by relief of the pain. The bowels are not constipated during these attacks, but move regularly once daily. Between these attacks the patient had been troubled at times by morning gagging; he does not know what causes this, but admits that in addition to the use of tobacco and the milder beverages, such as tea and coffee, he has been always a heavy drinker of beer. He has done heavy laboring work all his life.

Present Illness. The chief complaint is intense abdominal pain. The present condition began about sixteen hours previous to admission, with severe cramp-like pain in the upper abdomen. This came on him suddenly while at work, about 8 o'clock in the morning, and has continued without relief. The pain has remained

generalized over the upper abdomen. Shortly after the onset of the pain, he vomited a small amount of clear fluid. Vomiting has been repeated seven or eight times, and on the last occasion the vomitus was dark in color. Before admission to the hospital he was given three enemas by his physician; none of these were expelled. On admission he said his pain was somewhat relieved.

Physical Examination. The patient is well-nourished and does not appear older than his given age. Inspection of the eyes shows a bilateral coloboma, which he states is congenital. Aside from this abnormality the face, head, and neck are negative, as is the heart. Auscultation over the lungs, however, reveals an occasional rale at each base on deep inspiration. The *abdomen* is symmetrically distended; its walls are muscular, and there is no dilatation of the superficial veins. There is marked generalized rigidity, making palpation of the various organs or abnormal masses impossible. Palpation is painful over the entire abdomen, but especially marked above and to the left of the umbilicus. There is a peculiar doughy or cystic sensation to the palpating hand, different from that usually obtained in cases of peritonitis. On percussion the note seems unusually dull for gaseous distention, but no fluid wave can be obtained. The liver dulness appears to be about normal though it cannot be accurately outlined. There is entire absence of peristaltic sounds. Examination of the extremities and external genitalia was negative. The white blood cells numbered 18,000.

The patient was admitted to the hospital at midnight and refused to have any operation done. His vomiting continued, and by the following morning the vomitus was quite dark in color and was beginning to have a fecal odor. A second blood count showed 17,680 white blood cells, with 88 per cent. polymorphonuclears.

Operation. Between 1 and 2 o'clock in the afternoon of the day after admission, and thirty hours after the onset of his acute condition, the patient finally gave his consent for operation, which was immediately performed. At this time the abdomen was immensely distended and tense; there was dulness all over, except under the left lower ribs, the tympany here being due to the stomach. There was great tenderness everywhere. No peristalsis was audible. No definite diagnosis was made¹ but it was noted that "if this is peritonitis, there must be a quantity of pus under tension."

Nitrous oxide and ether were used for anesthesia, both of which were taken poorly. A right rectus (paramedian) incision was made in the epigastric and umbilical regions, the incision being enlarged

¹ The diagnosis on admission was "perforated duodenal ulcer."

subsequently to a length of 17 cms. (7 inches). Bloody serum poured out on opening the peritoneal cavity. (No growth was obtained from its culture). A few coils of obstructed small intestine lay in the right kidney pouch, distended to 7.5 cms. in diameter, and almost black. No coils of intestine tended to protrude, and in spite of the large abdominal wound it was impossible to deliver those seen. The hand, introduced, felt a large cystic mass as large as a football in the center of the abdomen, and a few coils of collapsed intestine to the left and in the pelvis. These were evidently the descending colon and sigmoid. The liver, stomach and pylorus could be felt in their normal positions above the mass. It was quite evident that all the small intestines, with the exception of the few obstructed coils first encountered, had entered a retroperitoneal hernia and were strangulated (Fig. 104). The entire mass was then delivered through the abdominal incision, by depressing the abdominal walls around it. The orifice of the sac could now be seen, about 5 cms. in diameter, on the right side of the mass, the intestines having entered from the right and travelled toward the left. As no important bloodvessel could be detected in the constricting ring, its anterior margin was divided for about 1 cm. The coils of intestine contained in the sac were then easily delivered, beginning at the upper end. All these coils were distended and congested, but unadherent. Their contents evidently consisted of an accumulation of intestinal juices, plus the three unexpelled enemas which had been administered to the patient before his admission to the hospital. The last coil extracted was black and looked almost gangrenous for a distance of 25 to 30 cm. This last coil was continuous with about 4 cms. of normal intestine which had not been within the sac, and which appeared to enter the cecum. The upper coils of small intestine which had been within the sac were almost normal, and were directly continuous with the much distended coils of small intestine seen on first entering the abdomen, and lying in the right kidney pouch. These much distended coils in turn were continuous with the duodenojejunal flexure, which lay within the orifice of the sac on its cephalad margin.

The condition of the terminal loop of ileum gave most concern. Upon application of hot saline solution the normal color was partially regained, with the exception of numerous small spots, where it was feared perforations might develop. An anastomosis was considered, but owing to the patient's condition, and the difficulty of finding the large bowel (which was pushed out of sight by the hernial sac), this idea was abandoned. In addition to the damaged

condition of the gut itself, the bloodvessels in the mesentery of several coils of intestine were thrombosed.

The hernial sac was then explored, the orifice now easily admitting the surgeon's hand. It was found to be an invagination of the posterior parietal peritoneum to the left of the origin of the jejunum;

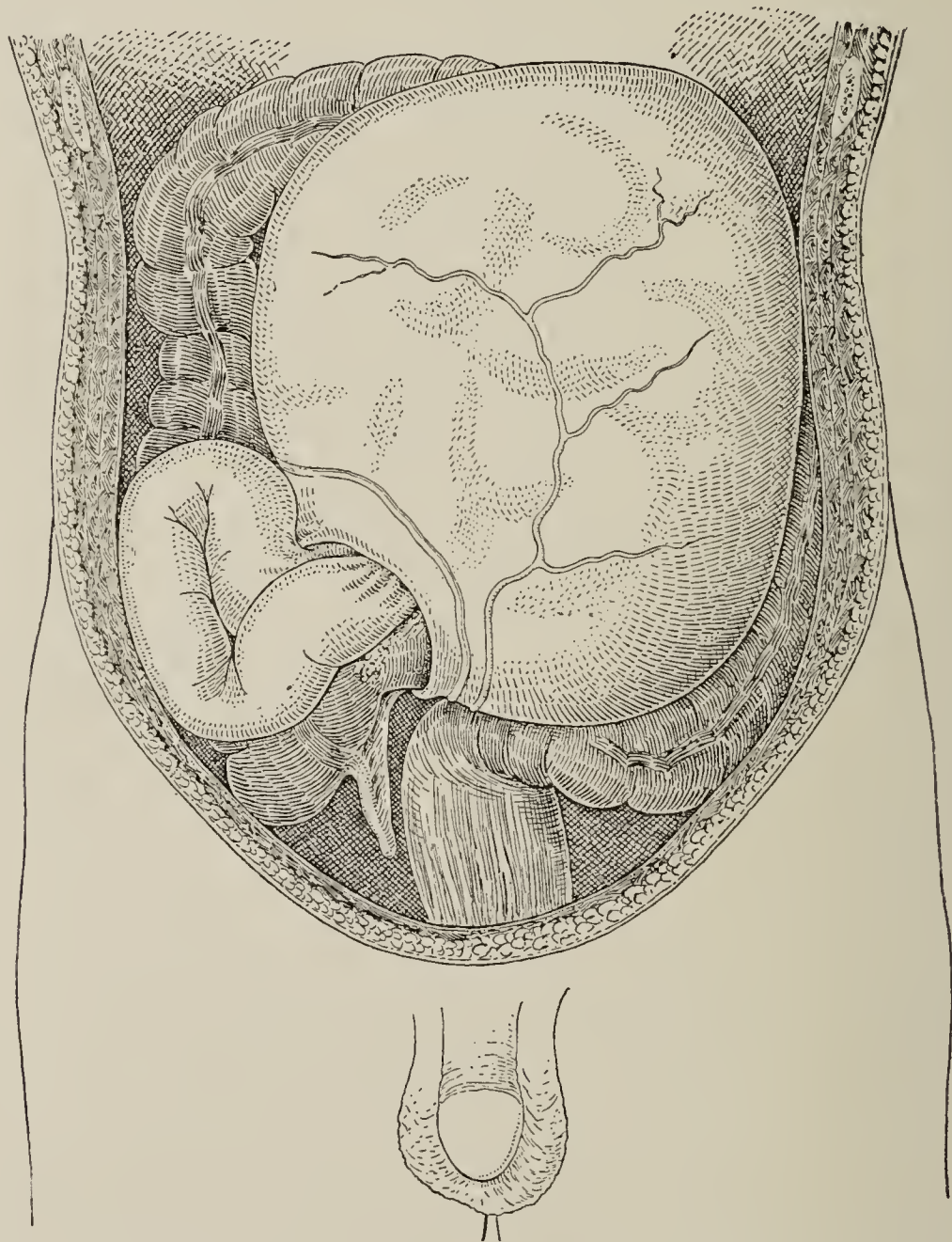


FIG. 104.—Diagram of a case of strangulated retroperitoneal hernia into the paraduodenal fossa.

and its entire contents, with the exception of the duodenojejunal flexure (which lay in the orifice) had been reduced. The free anterior margin of the orifice of the sac was now sutured to the posterior parietal peritoneum, with a continuous suture of No. 2 chromicized catgut. Gauze packs were removed from the abdomen, the intestines replaced, and the abdominal wound closed without

drainage, by means of heavy mass sutures of silkworm gut, passing through all layers of the abdominal wall; the anterior sheath of the rectus muscle was sutured separately with a buried suture of No. 2 chromicized catgut.

POSTOPERATIVE HISTORY. The progress of this case is interesting for the remarkable attempt of nature to restore the abdominal condition to normal.

On the *first day* after operation the patient retained water neither by mouth nor by bowel. He passed no flatus, but the abdomen was only slightly distended.

On the *second day* gastric lavage was necessary both morning and evening to relieve distention and vomiting. However, 2 pints of water were retained by bowel and about 7 ounces by mouth.

On the *third day* gastric lavage was required once. Four pints of water were retained by bowel and 10 ounces of broth, totaling about 40 calories, by mouth.

On the *fourth day* gastric lavage was required once. Four pints of water and a nutritive enema containing 776 calories were retained by bowel, and 6 ounces of water and small quantities of broth and albumen, totaling about 6 calories, were retained by mouth. Beginning impairment of the percussion note at the base of the right lung was noted today.

On the *fifth day* the abdomen was softer, there was less pain, and the total quantity of vomitus was only 11 ounces. Nourishment of 1552 caloric value was retained by bowel, and 18 calories by mouth. The lower third of the incision was infected. A clean cut basal pneumonia had developed on the right.

On the *sixth day* the abdominal condition continued to improve; 1552 calories of food were taken by bowel, and 85 calories by mouth. The abdominal incision was sloughing at its lower angle. Consolidation of the right base persisted and the patient was delirious at times.

On the *seventh day* the abdomen was distended and there was considerable vomiting. Rectal nourishment was discon-

tinued and 1126 calories were given by mouth; all of this nourishment, however, was not retained. The infection of the abdominal incision did not seem to be spreading, but one silkworm gut suture had torn out. The patient continued delirious at times.

On the *eighth day* the abdomen was softer and the patient was more comfortable. The total vomitus measured 10 ounces, while 5 pints of water and 826 calories of food were retained. The incision showed no marked change. Although the patient was still slightly delirious at times, he was less restless and the area of pulmonary consolidation seemed to be resolving.

On the *ninth day* the abdomen was soft and an alum enema was effectual. The patient retained practically all of 1159 calories of food, only slight vomiting occurring. The abdominal incision was beginning to granulate at the infected areas. The mental condition was more rational and the consolidated area in the lung was becoming replaced by moist rales. Coughing was severe, and a note was made that the patient seemed to be on the verge of his crisis.

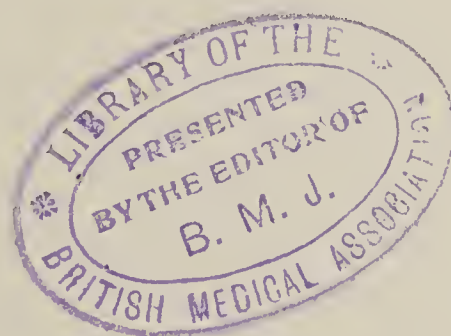
Unfortunately toward evening, after a severe coughing spell, the patient became more restless and complained of pain in his incision. On removal of the binder and dressings, it was found that about two feet of intestine were lying on the surface of the abdomen, the lower angle of the incision having given away. The intestinal coils were replaced under heavy doses of morphin and a few whiffs of chloroform, and the gaping part of the incision was sutured with through-and-through silkworm-gut sutures over a large gauze sponge, one end of which was allowed to protrude from the lower angle of the incision. Eight hours later the patient died.

It was impossible to obtain permission for an autopsy, but exploration of the abdomen through the operative incision showed that there was no active peritonitis. The sutures obliterating the orifice of the hernial sac were beginning to be absorbed, but very little agglutination of the approximated

serous surfaces had occurred, so whether the end result would have been a complete closure of this opening it is impossible to say.

We mentioned in the description of the operation that the free margin of the hernial orifice contained no important structures and that it was incised for about 1 cm. in order to relieve the strangulation. More careful examination, post-mortem, however, showed that the inferior mesenteric vein ran less than 2.5 cms. from the free margin, and that only a little further distant was the left colic artery, either of which might have been wounded had the incision been carried further.

Examination of the intestines showed what wonderful attempts nature makes to restore a damaged organ to normal. Much of the gut had regained its normal color, while those spots which we described as gangrenous had doubled up on themselves and their healthy edges had become adherent, thereby inverting the damaged area more perfectly than the surgeon himself could have done. This occurred in two instances, while a third threatening perforation was protected by adherent omentum.



TORSION OF THE GREAT OMENTUM; LAPAROTOMY; RECOVERY

BY EDWARD T. CROSSAN, M.D.
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CORNER and Pinches, writing in the *Medico-Chirurgical Transactions*, June, 1905, divided the evolution of medical knowledge concerning any disease into three stages:

1. Severe and fatal forms.
2. Milder clinical forms which are recognized.
3. When the disease in question is recognized frequently.

It is now thirty-four years since Oberst, in 1882, reported the first case of torsion of the omentum, yet Bookman, in 1915, with the aid of 93 cases reported by Hedley in 1911, was able to collect only 131 cases. Since Bookman's article, and up until October, 1916, I have not been able to find any more cases mentioned in the literature, so that the case below reported stands as the 132d. It is evident therefore that torsion of the omentum has as yet not reached the arbitrary third class established by Corner and Pinches.

According to Richardson, the term torsion of the omentum should be limited to those cases in which the twisting has been sufficient to produce evidences of strangulation.

There are two classifications of torsion of the omentum, one by Payi, and the second, which is the more generally accepted one, is that of Richardson.

Payi classified the cases thus:

1. Torsion without coexisting hernia.
 - (a) Simple cases involving omentum only.
 - (b) Complicated cases involving other abdominal organs.

2. Torsion with preëxisting hernia.
 - (a) Intra-abdominal without involvement of hernia.
 - (b) Intra-abdominal with involvement of hernia and strangulation and inflammation.
 - (c) Omental torsion within hernial sac only.
3. Complicated cases.
 - (a) Both intra-abdominal and hernial twisting.
 - (b) Other intra-abdominal or intra-hernial associated with retrograde incarceration.

Richardson's classification is much simpler, including three classes as in the former, but without the subdivisions. The three classes are:

1. Intra-hernial omental torsion.
2. Intra-abdominal omental torsion.
3. Intra-hernial and intra-abdominal.

In the first group are included those cases in which the point of torsion lies at least in part within the sac and is distinguished from strangulated hernia by the twisted pedicle and by the constriction at the hernial ring; the second class is comprised of those in which the point of torsion is partly within the abdomen and partly within the sac, but not constricted at the ring; in the third group there are two points of torsion, thus forming one or two masses of strangulated omentum, according to location of the distal point of torsion.

The torsion may occur at one point, about two separate points, or it may be complicated in its mechanism, as when the strangulation is produced by twisting of separate shreds about each other, or one shred about the main mass.

ETIOLOGY. Payi conducted some experiments on animals and came to the conclusion that the spirally disposed veins of the omentum acted as a factor, a view that is shared by Luckett. Richardson states that the formation of matted omentum at its distal end or fixation by an adhesion is necessary for the production of this pathological condition. Griffith holds to the view that it is necessary for the great omentum to be attached primarily over the right kidney, thus forming a point of adhesion and torsion.

The predisposing causes are malignant or tuberculous implantations, cysts, tumors, anomalous folds, adhesions and hernias. Volvulus occurs more often in males and at middle life. The presence of a hernia is an important predisposing factor, as shown by the fact that Hedley, in the 73 cases of which he could obtain details, found herniæ were or had been present in 60. Lejars believes that in 90 per cent. of the cases there is a hernia acting as a latent predisposing cause. Adhesions are also an important factor in bringing about the torsion, as demonstrated by Pilquet, who in an analysis of 60 cases found that adhesions were absent only in 8 of them; in 50 of these cases the omentum was fixed below, 43 of these in the hernial sac. But if adhesions are so important a factor, why does not volvulus of the omentum occur more often, since adhesions are of very frequent occurrence?

The exciting causes are some unusual effort of the abdominal muscles, acting on an already adherent omentum, or some irregular peristalsis, or forcible taxis, the latter being given as the cause in the first case reported, that of Oberst.

The mechanism Bookman likens to a flag swinging from a pole in the breeze, its lower end caught on an adjacent nail: a hammock-like arrangement is thus produced, and the wind continuing the flag wraps around itself, a tight mass being formed by rotation of the central portion; transferring this into terms of omental torsion, the flag would be the omentum, the nail would be replaced by an adhesion or a thickened matted end of omentum caught in a hernial sac, the wind would be forcible taxis, irregular peristalsis, etc.

PATHOLOGY. The omentum shows varying degrees of vascular disturbance, according to the extent of the torsion; there may simply be congestion but usually there is complete vascular obstruction, thrombosed vessels and gangrene. The omentum is also infiltrated with degenerated blood cells. In long standing cases there is always a possibility of infection, from hematogenous origin, or again the thrombi of the vessels may break up, setting free emboli, which would be especially apt to lodge in the lungs.

SYMPTOMS. There are two types of omental torsion, the acute and the subacute. The acute always has the symptoms of some acute abdominal crisis. Pain is the most constant symptom and it varies considerably in location; at times it is over the hernial mass, at others in the right lower quadrant. Armstrong reports a case where the pain was in the right hypochondrium, and a diagnosis of cholecystitis was made. Bookman's patient had pain in the left hypochondrium, due to twisting of the omental nerves at the upper pole, and he argues that since in all torsions there must be an upper reciprocal pole, pain in the hypochondrium should be a more or less constant symptom; yet he was able to find only one case in which the patient was said to have such a pain.

There is usually muscular rigidity spread over a wide zone, and later on a mass of ill-defined margins and doughy consistency will make its appearance, or in case the torsion is in the hernial sac the mass will become larger and incarcerated; and in both cases the mass is tender.

Vomiting occurs in 50 per cent. of the cases, and there is usually constipation, but where the torsion is close to the transverse colon bloody mucus stools occur, due to the congestion of this portion of the colon.

The patient, as a rule, does not appear to be so intensely ill, there is slight fever and elevation of the pulse rate, but not so marked as in the other acute abdominal conditions.

Where there is torsion in the hernial sac the symptoms are those of strangulated hernia minus the stercoraceous vomiting. In the subacute type, the symptoms are pain at the upper pole, in the sac or at the lower pole, vomiting, and sometimes symptoms of obstruction.

DIFFERENTIAL DIAGNOSIS. The correct diagnosis has been made only twice out of 132 cases now reported, the first case being that of Rudolph of Prague, the second that of Bookman in 1915. Bookman's diagnosis was based on the presence of a tender mass of doughy consistency in an old hernia, associated with pain in the left hypochondrium and bloody mucous

stools. The condition must be differentiated from acute appendicitis, twisted ovarian cyst and strangulated hernia. The patient is never so ill as in these affections nor are the pulse and temperature so high; and a tender mass is usually palpable.

It is differentiated from strangulated hernia by absence of stercoraceous vomiting. Stewart, in his paper in 1904, says that a tender mass of doughy consistency, occurring in a hernial sac, following attempts at forcible taxis, should be regarded as suspicious of volvulus. The practical point is that a case may be operated on for strangulated hernia, and if volvulus is not borne in mind, the pathological process may be left unremedied.

PROGNOSIS. Mortality of 13 to 14 per cent.

TREATMENT. Operative, of course, and removal of the gangrenous omentum.

CASE HISTORY. J. H., aged forty-eight years. Male. Laborer. Admitted October 21, 1916 to Dr. Ashhurst's service.

Personal History. Nine years ago he had a blister around the right foot, following which one of the toes turned black and was removed; one year later the right leg was removed a few inches below the knee for a similar affliction. At the time of and previous to the above-named operations he was told that he had diabetes, but for the last four or five years his urine has been sugar-free. At the present time he has polyphagia, polydypsia, and polyuria but no pruritus. No cough, dyspnea, or edema.

For the last ten years he states that he has had a hernia on the left side, but has never worn a truss.

History of Present Illness. Up until six months ago the hernial mass was very small, but at that time began to enlarge but was always reducible. On October 19, 1916 the hernial mass prolapsed and could not be reduced (taxis was attempted by the family physician) the hernia gradually grew larger and there was severe pain over the mass. Bowels moved regularly, no vomiting.

Physical Examination. Temperature, 100.4° F. Pulse, 104. Respirations, 24.

Head, neck, and chest normal.

Abdomen. Markedly obese. In the left inguinal region is a mass the size of an apple, of doughy consistency, without an expansile

pulsation on coughing and irreducible. In the right inguinal region there is slight bulging on coughing with an enlarged ring, but no distinct hernia.

Rectal Examination. Moderate enlargement of the prostate. No hemorrhoids.

Extremities. Right lower extremity absent from two inches below patella.

Blood-pressure. Systolic, 140; diastolic, 80.

Diagnosis. Strangulated inguinal hernia.

Operation. October 21, 1916 (Drs. Ashhurst and Crossan). Operation started at 1.15 P.M. Concluded at 1.45 P.M. Primary incision four inches long over the left inguinal canal and through this the fascia of the external oblique split, sac discovered, opened and found to contain gangrenous omentum with a very thick extremity caused from the matting of the omentum together; no adhesions found. Traction was made on the omentum with the view of encountering healthy omentum, but after delivering several inches, and as also this was found to be gangrenous, it was decided that the abdomen should be opened so therefore the incision was prolonged upward and outward and the peritoneal cavity opened. The whole omentum was found to be gangrenous, and twisted on itself clockwise with the point of torsion just about two inches below the transverse colon. The torsion was released by counter-clockwise twisting and then it was ascertained that there were two complete turns. The omentum was ligated in sections by No. 2 chromic gut and the diseased portion removed and found to weigh 580 grams. Rubber tube placed in pelvis, peritoneal edges closed by continuous No. 2 chromic gut. The sac was then dissected out and removed and the inguinal canal closed without transplanting the cord.

Progress. For the first twenty-four hours the patient was treated as a case of peritonitis. There was no drainage from the abdomen, and the rubber tube was removed on the fifth day after operation. On the tenth day a stitch abscess showed up.

Discharged from the hospital December 22, 1916, thirty-two days after operation, in good condition.

The above case was admitted to the hospital on an operating day and was immediately sent to the operating room, and no white blood count was made.

There is nothing unusual in the case, as it seemed to be of

the most common type, namely of intra-abdominal torsion with involvement of associated hernia, and that it occurred in a male past middle life, who had a long standing rupture.

Unfortunately no history was obtained of pain in either hypochondrium, nor of bloody mucous stools, which it seems should have occurred in this case since the point of torsion was so close to the transverse colon. The precipitating cause here would seem to be forcible attempts at taxis.

REPORT OF A CASE OF PURPURA HEMORRHAGICA MISTAKEN FOR APPENDICITIS

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THE case being reported is one of interest from the standpoint of diagnosis.

On August 21 a boy, six years of age, was referred to the Episcopal Hospital by an outside physician, with the diagnosis of appendicular abscess.

The history of the case given by the mother, reads as follows:

Family History. Mother, father, and one sister living and well.

Previous Medical History. Measles and whooping cough in infancy. Child has always been pale but general health has seemed good except for an occasional attack of tonsillitis.

Present Illness. Three days ago, about two hours after the mid-day meal, the child complained of severe pain in the abdomen, followed in a short time by vomiting. The family physician was called and pronounced the case Enteritis. A purge was given. The pain, with occasional vomiting, lasted until the following day. The child was kept in bed, and on the third day the family physician made the diagnosis of appendicitis and advised sending the child to the hospital.

On examination the patient presented the following picture. He lay in bed with his right thigh acutely flexed on the abdomen, and the member could not be extended without agonizing pain. There was a decided pallor, which, as stated in the history, had always existed.

Head. Conjunctiva was somewhat pale, pupils moderately dilated, equal and reacting to light. Tongue coated, teeth poor, tonsils hypertrophied, cervical glands palpable.

Chest. Heart and lungs negative.

Abdomen. Just above Poupart's ligament on the right side was a mass, well defined and tender. There was slight rigidity of the right side of the abdomen; the left side seemed normal.

Extremities. On the left anterior tibial region were two ecchymotic spots about the size of a dime which were taken for bruises. Reflexes normal.

Temperature, 101° F. Pulse, 100. Respirations, 28. Leukocytes, 14,000.

It was a question in my mind whether I was dealing with a psoas or an appendiceal abscess. The points in the history and examination were in favor of the latter.

The chief on whose service the child was, and who permitted me to report this case, was operating when the patient came in. The child was taken directly to the operating room and the abdomen was opened on my diagnosis.

Operation. Ether anesthesia. Incision made over the top of the mass. The blood that flowed into the skin incision was very dark, just about the same color we see when a patient is getting too much nitrous oxide gas. The abdominal muscles were almost black. The peritoneum was opened and the appendix presented in the wound, apparently normal. The peritoneal fluid was in excess and slightly blood tinged. The mass, which was felt through the abdominal wall, was found to be retroperitoneal, and consisted of a blood clot. The patient's condition would not permit further investigation, so a cigarette drain was inserted and the abdomen closed.

The patient died the same evening without reacting.

Several hours before death it was noticed that, in addition to the two ecchymotic spots on the left tibia, there were many others on the lower extremities and also on the abdomen in the region of the wound.

A *postmortem* examination could not be obtained, but the wound was reopened and enlarged. Unsatisfactory as it was, the following important points were noted: Wherever the intestines were touched at the time of operation there were ecchymotic spots almost corresponding to finger prints. There was a retroperitoneal blood clot extending from Poupart's ligament to the upper pole of the right kidney. The peritoneum was adherent to the clot at a point corresponding to that of the patient's pain. The clot was removed and a ruptured vessel looked for but none was found. Both kidneys were taken out and incised. In the cortex and medullary portion of both were found small hemorrhages. A blood clot was found in the pelvis of each.

ILIAC ABSCESS

BY WILLIAM WHITAKER, M.D.
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ILIAC abscess not due to appendicitis and not due to bone caries has received very little attention in text-books of surgery. Judging from the following seven cases, six of which appeared in the Episcopal Hospital in a comparatively short time, it does not seem to be a rare condition. Among the cases described in the literature, some have followed traumatism and others, like two of the cases here reported, have occurred without any discernible cause.

Cases of great traumatism, with rupture of the liver or kidney and hemorrhage into the retroperitoneal tissues, have resulted in retroperitoneal abscess. Also, inflammation of the retroperitoneal tissues with abscess may follow suppurative infections of the appendix, gall-bladder and pancreas.

Sprengel believes that the general peritoneal cavity may be uninvolved after appendicitis, yet we may have suppuration in the retroperitoneal tissues. None of these conditions were present in the cases here reported.

Six of the 7 cases occurred in males between the ages of seven and thirty-six years. One occurred in a girl aged six years. In 4 the abscess was on the left side, and in 3 on the right side.

Cultures from the pus showed staphylococcus in 5 cases. One case gave a mixed growth with many diplococci, and 1 case of left retroperitoneal abscess showed rods of colon morphology.

All the cases were operated on by Dr. A. P. C. Ashhurst, and I am indebted to him for the operative notes and for the privilege of reporting the cases.

CASE I.—George W., aged nineteen years, came to the surgical dispensary because of severe pain in the right groin and inability to extend the right thigh. Two weeks ago, September 16, 1916, while playing football, he fell heavily on his right great trochanter. The pain was bad enough two days later to cause him to limp, it steadily grew worse until extension of the thigh was impossible.

Examination showed a mass in the right iliac fossa, extending from the middle of Poupart's for three inches toward the umbilicus; no evidence of vertebral disease. Has suspicious signs of old lesion at the apex of the right lung. No cough. X-ray of the hip and spine were negative. Temperature 101° .

Operation. October 6. Nitrous oxide anesthesia. Incision above and parallel to Poupart's ligament opening the aponeurosis of the external oblique. Internal oblique and transversalis pushed toward the umbilicus, floor of the inguinal canal explored near the internal ring. Peritoneum is pushed away from the iliac fossa exposing a tense, resilient mass, covered by dense fascia. Groove director is thrust into this mass and gave exit to inodorous, dark, yellow pus, culture from which showed staphylococcus. Opening enlarged by forceps and explored by finger; cavity seemed to extend close to the pelvic wall down to the sacrosciatic notch. No bare bone. Cavity entirely extraperitoneal. Abscess probably result of hematoma in iliacus muscle with metastatic infection through the blood. No history of tonsillitis or pharyngitis or other infection. Abscess cavity drained freely following the operation. Remained in the hospital eighteen days. November 23 the wound is healed and the patient is well and at work.

CASE II.—Nellie M., aged six years. Admitted August 12, 1913. Was kicked in the right lower abdomen two weeks ago. Has not been well since that time and has had a slight fever.

Examination showed a tense, exceedingly tender, but not red swelling above the outer part of the right Poupart's ligament, suggesting deep pus. Under ether mass outlined from level of anterior superior spine half way to the umbilicus and almost down to the symphysis. On rectal examination a mass is felt to the right. Leukocytes, 39,840. Temperature, 102.2° . Pulse, 110.

Operation. Ether. Incision close to Poupart's ligament. Scarpa's fascia densely adherent to the external oblique and this

adherent to the internal oblique, evidently inflammatory. In separating the internal oblique from Poupart's close to the anterior superior spine of the ilium, a gush of thick, odorless, pale yellow pus occurred. Drainage tube and gauze. Culture of pus showed staphylococcus. Patient remained in the hospital sixteen days. Patient has moved from former address and cannot be located.

CASE III. Robert T., aged seven years. Admitted July 31, 1909, with signs of coxalgia (recent) which appeared following a fall. Was put to bed with extension, but the thigh did not become extended. Pain in the hip, restless at night. White blood cells 8000. Temperature became hectic, 103° down to 99° . Mass in left iliac fossa above Poupart's ligament, tender. Leukocytes risen to 18,000. (Patient in Dr. Hodge's service in the Children's Hospital of Philadelphia.)

Operation. McBurney incision close to left anterior superior spine of ilium. Peritoneum pushed up, explored with finger, felt spine of ischium. While exploring 2 ounces of pus welled up, inodorous. Culture staphylococcus. Rubber tube drain.

August 4, 1909. Tube out, little discharge, temperature normal.

November 23, 1916. Patient cannot be traced.

CASE IV.—Edward B., aged thirteen years. Admitted January 23, 1915. No known cause of illness. Teeth in poor condition. Pain began in the left thigh and hip two weeks ago.

Examination. On admission temperature 100.8° . Pulse, 100. Leukocytes, 16,720. Mass in left iliac fossa about size of a lemon, rectus over mass is not rigid.

Operation. McBurney incision. Opened retroperitoneal abscess, thick creamy inodorous pus. Culture showed rods of colon morphology. Abscess seemed to have no bony focus, though sacral canals and walls of pelvis could be felt, all covered by periosteum and fascia. No bare bone. Tube and gauze drain. Remained in the hospital twenty-one days. In November, 1916, the patient has moved and could not be found after a diligent search.

CASE V.—Simon S., aged thirty-six years, admitted January 20, 1916. About one year ago, after heavy lifting, he felt something give away in the left groin. Physician advised an abdominal belt which he wore. Couple of weeks before admission he had pain and numbness in the left knee. On admission had pain in the left knee and hip and lower abdomen with symptoms suggesting stone in ureter. Examination showed a mass in the left iliac fossa and slight tenderness in left costovertebral space. Temperature hectic, cannot fully extend hip. A diagnosis of Psoas abscess was made. Urine and spine negative. X-ray negative.

January 23, 1916. Leukocytes 18,720. Temperature, 103° to normal.

Operation. Nitrous oxide anesthesia. McBurney incision at left anterior superior spine of ilium. On pushing away the transversalis fascia and extending the finger along the iliac bone a gush of inodorous creamy pus, culture from which showed mixed growth with many diplococci. Abscess cavity extends almost to Poupart's ligament, up over crest of the ilium to its outer surface in loin, and thence upward toward the lumbar spine. No bare bone could be felt. Kidney not felt. About 10 to 12 ounces of pus escaped. Wiped cavity dry with iodoform gauze and drained by rubber tube and iodoform gauze, using nearly one yard, 8 inches wide.

January 31. Temperature normal and steady. Remained in hospital twenty-one days.

August 23. Scar firm. No evidence of any spinal disease. No subjective symptoms except sometimes pricking around region of operation. Is at work.

CASE VI. John G., aged thirty years, admitted August 8, 1916.

July 30. After stepping from a trestle two feet in height, was seized with severe pain in the left side, low down in the abdomen. This lasted but a few minutes and he thought no more of it. August 1, the pain returned and has been continuous, dull and throbbing in character. August 2 and 3 the pain was severe enough to keep him from sleeping.

On admission, temperature was 99.4° and pulse 80.

Examination. Showed mass in the left inguinal region and slight tenderness. Diagnosis Epiplocele. Right inguinal region showed indirect inguinal hernia.

Operation. Ether. Right inguinal herniorrhaphy and incidental appendectomy. Then, opened left inguinal canal, but found no sac. Cord indurated and adherent. Opened the peritoneum through a McBurney incision above the left internal ring; found omentum adherent along the left iliac vessels. Excised the inflamed adherent omentum. No sac at internal ring. Mass found extra-peritoneal, evidently lymph nodes. Closed the peritoneum. Detached the cord and internal oblique from Poupart's ligament, ligated and cut deep epigastric, and began enucleation of mass of iliac lymph nodes. After detaching them from the external iliac vessels as far as the common iliac, on beginning to separate them from the parietal peritoneum a gush of inodorous, creamy pus occurred from the center of the mass of lymph nodes. Culture

showed staphylococcus. Placed iodoform wick in center of abscess and desisted from further attempt to remove the mass. Repaired wound without transplanting the cord.

August 14. Leukocytes, 20,000. No history of any sore on foot or leg or genitalia.

Patient remained in the hospital twenty-nine days. Was absent from work two months in all. Examined November 19, 1916: Has no symptoms, feels perfectly well, and is at work.

CASE VII.—Herman J., aged thirteen years. Admitted September 9, 1916. Two and one half weeks before admission he jumped from a roof and injured his right side. One week after the injury pain began in the right leg and hip. His right leg began to draw up and the pain became very severe in the right groin. He was taken to a hospital and diagnosis of tuberculous coxitis was made. He was referred to the Episcopal Hospital.

Examination. Temperature 101°. Right thigh flexed to 60 degrees on the abdomen; a mass in the right iliac fossa extending half way to the umbilicus; motion of the hip free within a limited radius. Leukocytes 12,280. Diagnosis—iliac abscess. X-ray negative. Teeth in poor condition.

Operation. Nitrous oxide anesthesia. Two coats of iodine only preparation. Incision parallel to Poupart's ligament from the anterior superior spine in three inches; divided external oblique, pushed internal oblique away from Poupart's and pushed transversalis fascia and peritoneum away from the iliac fascia and found mass between finger and iliac bone. Incision in hard mass gave exit to curds of pus. Culture showed staphylococcus. Entered the cavity between the ilium and the iliacus muscle. Periosteum not raised from bone, which felt smooth and normal. Abscess probably in hematoma under iliacus muscle. Rubber tube drain and iodoform gauze.

Remained in the hospital twenty-one days. Walked with slight limp when he left the hospital.

Present Condition. November 23. Still has slight limp. Has returned to school and feels perfectly well.

All of the above cases resulted in prompt recovery following incision and drainage. In no case was a definite focus of infection located, although the teeth were in poor condition in many. In 5 cases, traumatism preceded the development of the abscess and in two of these tuberculous coxitis was the condition thought of when the cases were first seen.

In the traumatic cases, it seems most logical to believe that a hematoma formed either in the iliacus muscle or in neighboring retroperitoneal tissues, and that this subsequently became infected through the circulatory channels. It has been possible to trace four of the cases; all are well and have returned to their usual occupations.

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CHOLELITHIASIS, WITH MULTIPLE GASTRIC HEMORRHAGES; CHOLECYSTOSTOMY; RECOVERY

By EDWARD T. CROSSAN, M.D.
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A. H., female, aged sixty years; occupation, housework. admitted to Dr. Mutschler's service February 17, 1916.

Family History. Negative.

Previous History. Twenty-seven years ago had some sort of a gynecological operation in the hospital. Up until the past year has been in fair health, since which time she has had irregular attacks of flatulence, pyrosis and occasionally vomiting. No melena or hematemesis. Uses alcoholic beverages in moderation.

Present Illness. On the morning of admission was seized with a sharp, severe abdominal pain, localized around the umbilicus, and radiating to the back at a spot directly opposite and accompanied by nausea, vomiting of bile stained material, and weakness. No other symptoms.

Condition on Admission. Elderly female with some severe colicky pain in the abdomen as evidenced by the posture of acute flexion of the body on the thighs. Pulse 68. Temperature 97°. White blood cells, 17,000. Urine shows a few red blood cells and a trace of albumin.

Eyes. Pupils react equally to light and accommodation.

Mouth. No blue line on the gums.

Chest. Lungs; negative.

Heart sounds weak and distant.

Abdomen. There is a general spasm of the abdominal muscles with tenderness all over abdomen most marked in the right iliac fossa. Peristalsis audible throughout. No signs of fluid.

Pelvis. No masses.

Rectum. No masses.

After admission to ward, head of the bed was elevated, proctoclysis and nothing by mouth ordered.

February 18. Complains of severe pain in the back, is still tender in the right iliac fossa, no vomiting. Temperature, 103°. Pulse, 110.

February 20. Still is tender in the right iliac fossa, and still complains of severe pain in the back. Ordered free purgation.

February 24. Temperature still slightly elevated, tenderness and pain less. X-rays of chest, kidneys, and ureters negative.

February 29. For the last four days temperature has been normal. Does not have any pain or tenderness now. Discharged.

At the time of admission no diagnosis could be made; it was later thought that she was suffering from acute appendicitis, because of the persistent tenderness in the right iliac fossa.

Patient was readmitted on April 17, with the history that since her discharge from the hospital she has been in fair health, except for an occasional abdominal pain, which, however, did not bear any relation, to the taking of food. Has not had any vomiting, bowels have been regular.

Three days before admission she vomited a large amount of fresh blood without any clots and not accompanied by nor preceded by any symptoms. Since the first attack of hematemesis, she has had a similar one daily.

Condition on Admission. Temperature, 99.4°. Pulse, 120. Urine: trace of albumin and an occasional hyaline cast. Red blood cells 2,800,000; white blood cells 6800; hemoglobin 52. X-ray of stomach and abdominal aorta negative.

Head. Eyes. Pupils react equally to light and accommodation.

Mouth. Same as on previous admission except for pallor of the mucous membranes.

Chest. Same as in previous examination excepting for the prominence of the veins over the chest wall and a soft murmur over all the valve areas.

Abdomen. Slight tenderness over epigastrium, no tenderness over gall-bladder, nor any pain on percussion over the gall-bladder at the end of inspiration. Peristalsis normal. Marked pulsation of the aorta. Liver not palpable, upper border at the sixth rib.

Rectum. No hemorrhoids.

April 21. Ever since admission has vomited a pus pan full of blood daily, always fresh blood, never contains any clots, and is not preceded by or accompanied by any symptoms. The patient seems to regurgitate the blood without any effort. Hemoglobin

25, red blood cells, 1,200,000. At this time the diagnosis of gastric ulcer was made.

Operation (Dr. Mutschler). Right rectus incision: stomach delivered and examined, no adhesions or ulcers or signs of a mass. Omentum found adherent to the liver for a distance of about two inches, also found adherent to the gall-bladder; these were separated and it was found that the gall-bladder was full of stones. Gall-bladder opened and fifty-three stones of a greenish hue were removed. Ducts explored but no stones found. Cholecystostomy performed in the usual manner.

Patient's condition was very poor while on the operating table, but she reacted very well.

May 5. Patient made an uneventful recovery. Rubber drainage tube removed on the tenth day, and biliary drainage ceased at that time. Wound healed on the twelfth day. Has not had a hemorrhage since operation, nor any abdominal pain. Discharged on request of patient.

CASE OF FOREIGN BODY (FISHBONE) LODGED IN LIVER AND REMOVED BY LAPAROTOMY; DEATH FROM SUPPURATIVE HEPATITIS

WITH AN ANALYSIS OF TWELVE OTHER CASES OF FOREIGN
BODIES IN THE LIVER

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MR. SAMUEL D., aged sixty-two years, a patient of Dr. Rowland G. Paynter of Georgetown, Delaware, was referred (August 15, 1916) to Dr. Ashhurst's service in this Hospital by his physician and by Dr. Wm. Egbert Robertson, who had seen the patient in consultation, and who had made a diagnosis of abscess of the liver.

The patient's *family history* is negative. His wife is living and and well. She has never had any children or miscarriages.

Personal History. Patient states that he is a farmer by occupation. Nine years ago he had what the doctor diagnosed as appendicitis and peritonitis. He denies ever having had any other illnesses. Since the above-named illness he states that he has been in perfect health. The appetite has been good, he has not had any flatulence, pyrosis, vomiting, or pain after eating. Bowels have been regular. Has not had any pain or bleeding on defecation, nor pain anywhere in the body. Up to the onset of the present illness he states that he has not had any cough or dyspnea. Has had polyuria but no frequent micturition, no trouble in urinating or starting the act, no dribbling, no pain in the bladder or rectum. He states that he has not had any sores on the body antedating the present illness, nor has he ever had any sores which would not readily heal. Denies venereal history.

Present Illness. July 4, 1916, patient states that he was taken with a chill, since which time he has had a chill every day; occasionally, he thinks, he had them twice a day, the chills being

accompanied by fever and sweat, at times by vomiting, and up until four days ago by cough, dry in character; no hemoptysis. Has not had any headache, running ear or sore throat, pain in the back or abdomen. No jaundice, no pain on micturition, urine of usual color, no pain in any joints, no pain in the precordium, no diarrhea. Since the onset of the present illness he has been confined to bed and has been losing weight.

Condition on Admission. Patient is of very pallid complexion; breathing is hurried; he is restless, but does not complain of pain. Temperature, 99.2° F. Pulse, 124. Respirations, 24. White blood cells, 34,000.

Head. No tenderness over any of the sinuses, no tenderness over the mastoid. No purulent discharge from the ears.

Eyes. Pupils react, scleræ clear.

Mouth. All of the upper teeth are gone, lower bicuspid and molars are missing. The teeth which are intact are very poor, with receding gums, but none of them are tender to pencil percussion.

Neck. Negative, no stiffness.

Chest. Supraclavicular fossæ are prominent. Expansion is poor but equal. Lower chest on both sides is bulging, the right side more than the left, with the circumference of the right chest at the level of the xiphoid cartilage a half-inch greater than the left. Veins of the right chest are more prominent than the left. Interspaces over the lower right chest obliterated. The skin over the lower chest walls on both sides is mottled, with a slight edema of the lower right chest wall. No tenderness over any of the dorsal vertebræ. No tenderness on percussion over the sternum.

Lungs. Posteriorly, the note at the right apex is impaired. Beginning at the ninth dorsal vertebra, the note at the right base is decidedly impaired. Note over the left lung is normal. Tactile fremitus increased at the right apex, diminished at the right base, normal elsewhere. Vocal resonance similar. Over the right apex there is prolongation of expiration. No rales. Over the right base an extraneous sound is heard on inspiration, similar to many crackling rales, but from its proximity to the ear it is thought to be a friction rub, and this is heard all over the base. Breath sounds elsewhere posteriorly are normal. Anteriorly, note of fair resonance at both apices; on the right, commencing at the third interspace in the mammary line and the fourth rib in the mid-axillary line is an area of impairment merging with the liver dullness. Left side is normal. Tactile fremitus is diminished over the

area of impairment and extending down over the liver dulness a rough sound, supposedly a friction rub, is heard on deep inspiration; breath sounds are diminished in intensity over this area. Left side is normal.

Heart. Left border is one inch outside of the nipple line, upper border at the second interspace, right border at midsternum. Heart sounds are very rapid and distant, but are clear.

Abdomen. Protuberant. Lower border of the liver one and a half inches above the umbilicus in the mammary line. The spleen is not palpable. Tenderness to pressure in the right hypochondrium. No tenderness elsewhere. No masses or herniæ. No dilated venules. No tenderness over any of the lumbar vertebræ, no tenderness in the renal fossæ.

Genitalia. Negative.

Rectal. Moderate enlargement of the prostate; no masses, no hemorrhoids, no areas of tenderness.

Extremities. Moderate arteriosclerosis. Knee-jerks diminished. No Kernig's sign.

Blood-pressure. Systolic, 90; diastolic, 60; blood count: white blood cells, 34,000.

August 16. While examining the patient this morning he had a chill. Operation today—transpleural hepatotomy.

August 16. *Operation* (Drs. Ashhurst and Crossan). Local anesthesia (B. eucain 1 per cent.), preceded by hypodermic of morphin and atropin. Patient prone. Incision started over the eighth rib at the paravertebral line, carried down to the tenth rib, and then prolonged downward and carried along the course of the tenth rib. The skin and subcutaneous tissues are then dissected up and portions of the ninth and tenth ribs removed. Pleura opened accidentally in the course of resection of the tenth rib, no intrathoracic condition is found. Diaphragm sutured to the intercostal muscles by interrupted chromic catgut. Diaphragm incised and the peritoneal cavity opened. Peritoneal cavity is packed off and the liver brought into view; it was found covered with a thin exudate of lymph, with recent adhesions between the liver and the diaphragm. Subphrenic space explored but no pus is found. Liver surface is smooth. No nodules or small abscesses seen, except one small yellow spot, resembling a miliary tubercle. The peritoneal capsule is now opened and the convex surface of the right lobe of the liver is palpated as far as the fingers can reach, about six inches in all directions; but nothing abnormal is detected. A grooved director is then passed into the liver substance, and five



FIG. 105.—Fishbone from liver. Actual size.

or six punctures are made in various directions through the single point of entrance; but no pus can be located. Iodoform-gauze drain is then passed through the opening in the diaphragm onto the surface of the liver, the isolating packs are removed, and the remainder of the diaphragmatic wound closed with No. 2 chromic catgut interrupted sutures. Muscles are approximated with interrupted chromic catgut No. 2. The skin is then closed with heavy silkworm-gut interrupted sutures. Dressings are then applied. Time of operation fifty minutes.

August 17. The condition is much improved today. Systolic blood-pressure increased 15 points. Gauze wick in the back is draining a bloody fluid, no pus. Patient does not have any complaints. X-ray shows the liver to be enlarged and suggestion of a mass in the region of the left lobe.

August 18. The leukocyte count today is 19,000, with 95 per cent. polynuclears. Though there has been no chill since the operation two days ago, it is evident that the focus of infection has not been reached; and as there seems no hope of saving the patient's life unless this is accomplished, it is determined to explore the liver and bile ducts through the abdomen.¹

August 18. *Second operation* (Drs. Ashhurst and Crossan). Gas-oxygen anesthesia, preceded by morphin-atropin. Removal of foreign body from left lobe of liver; cholecystostomy. Incision from the ensiform to just above the umbilicus, to the right of the midline. Fibers of the rectus separated, peritoneum opened and general abdominal cavity packed off. Liver was enlarged, extending below the ribs, was of slate color, but was smooth and did not show any signs of abscesses. Exploration of the upper surface of the left lobe negative. No collection of pus between the liver and the diaphragm, either side. Gall-bladder normal in size and thickness. Pylorus and duodenum were adherent to the under surface of the left lobe of the liver. These adhesions were cautiously separated, when, on palpation to the left of the neck of the gall-bladder close to the median line a sharp-pointed object was felt and with some difficulty removed by forceps; then it was ascertained to be a fishbone (Fig. 105). This evidently had ulcerated through the pyloric or duodenal wall, and had in part entered the under surface of the left lobe of the liver. Gall-bladder is packed off, opened and dark, thick, viscid bile emerged. Rubber tube is sewn into the gall-bladder; this latter is not inverted. Cigarette

¹ It was now suggested by Dr. Robertson that a foreign body in the biliary tract might account for the symptoms.

drain down to the kidney fossa. The wound is closed in layers, with several splint sutures of silkworm gut, carried down to the peritoneum. Dressings applied. Time of operation one hour. Patient took gas very poorly and on one occasion stopped breathing.

P.M. temperature 104° F. Draining a dark, thick bile.

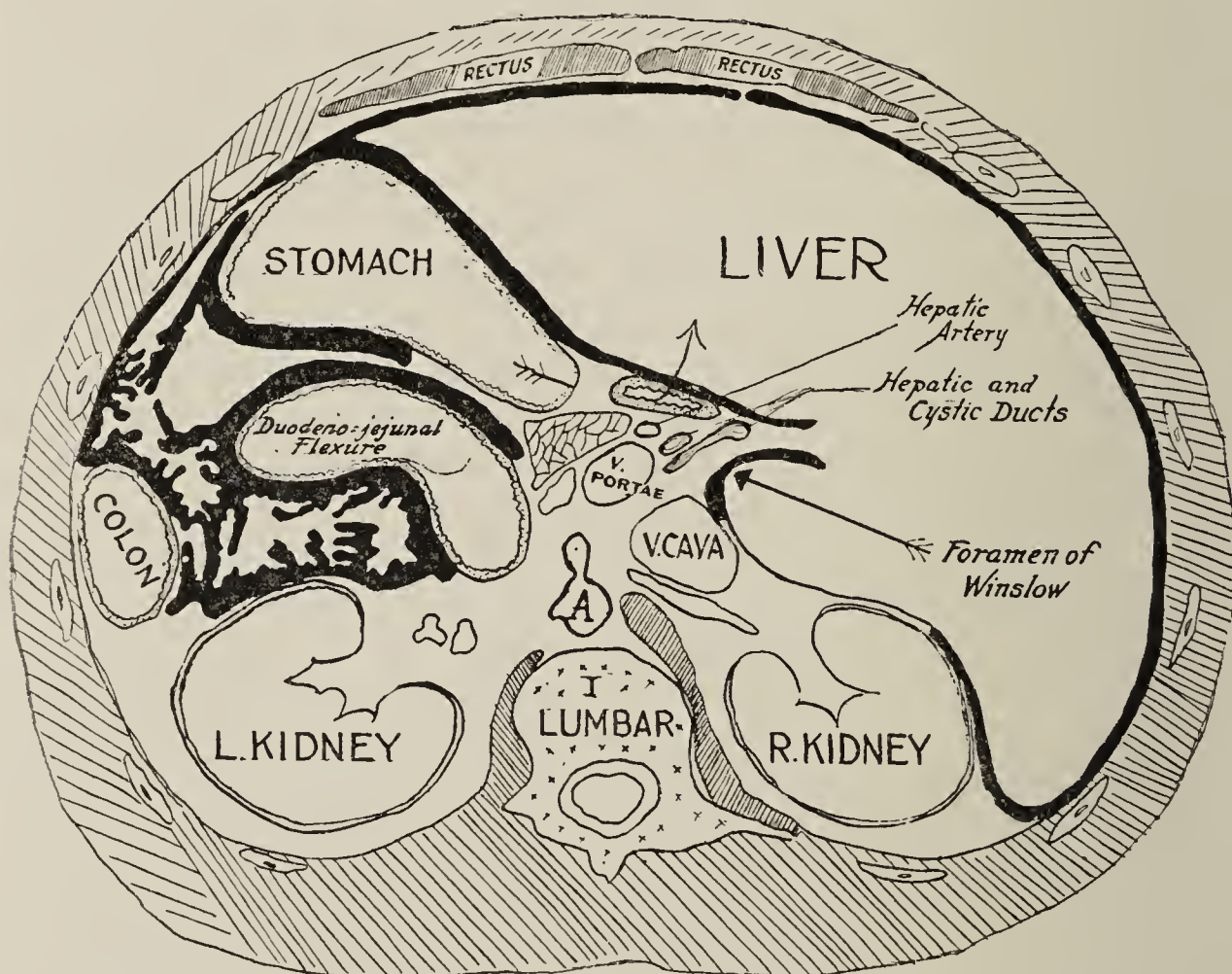


FIG. 106.—Cross-section of abdomen at level of first lumbar vertebra. Arrow from stomach passes through pylorus into ascending (first) portion of duodenum, and thence into liver, showing track of the fishbone. Peritoneal cavity in black. (After Eyclesheimer and Schoemacker.)

August 19. Had a very comfortable night. Patient looks much better this morning. Bile is still thick and viscid. Temperature is around 102° . White blood cells, 19,920. Patient takes a slight amount of nourishment.

August 20. Toward afternoon of August 19, patient became very restless and the pulse became faster and the evening temperature was around 104° . Did not complain of any pain in any region. Was slightly delirious. This morning the patient was slightly delirious. Patient had voided urine voluntarily once during the night and involuntarily several times. This morning voided 12 ounces voluntarily, but examination showed that there

was still some urine in the bladder, and about 16 ounces were removed by catheterization, after which the patient became quiet and settled down into a light sleep. The abdomen is slightly distended and the patient is given an enema. Pulse, 116. Temperature, 99.4° this morning. Bile drainage from 11.30 A.M. yesterday was 5 fluidounces; bile is still very dark and thick. No cough. Gauze drainage removed from the thoracic incision in the back, and cigarette drain removed from the abdominal incision. Patient takes sparingly of nourishment. Twenty-four-hour elimination of urea 8.9 grams. Reëxamination of the x-ray did not show any shadow of foreign body removed at the time of operation.

August 21. P.M., temperature, 102°. Bile drainage, 2 ounces and 1 dram; bile is becoming lighter. Patient has been very dull ever since admission to the house. No more chills. Elimination is decreasing, permanent catheter inserted. Patient is losing ground.

August 22. P.M., temperature remains about the same. Bile is clear. Drains 1½ ounces. Patient is semidelirious.

August 23. All of today the temperature has been around 103°. Pulse is becoming very rapid and weak. Patient is very stuporous, and has involuntary eliminations. Respirations ceased about 6.30 P.M.

Laboratory Records (Dr. C. Y. White). Postmortem examination showed no involvement of the lungs or heart, nor any pathological conditions. Liver removed—dark in color and much larger than normal. In the right lobe of the liver, close to the sulcus between the lobes, there were found two large abscesses; and in the left lobe of the liver, three inches beyond the sulcus, there were many abscesses, very small. Point of origin of the abscesses not found.

Blood culture of August 15 reported as *Staphylococcus pyogenes albus*.

Microscopic examination of the liver showed: Cirrhosis of the liver, and multiple miliary abscesses; veins and gall ducts normal.

Smear and culture from the pus of the liver abscesses, reported as "mixed." Smear and culture from the fluid around the liver (obtained at first operation) reported as *staphylococcus*.

In this interesting case it was not possible to ascertain when the fishbone had been swallowed. There had been absolutely no symptoms before the chill which occurred on July 4.

There are appended abstracts of 12 similar case reports which I have been able to find in the Index Medicus and the Index Catalogue of the Surgeon General's Office, U. S. Army. Cases in which the foreign body entered the liver from without, through the abdominal or thoracic wall, and in which immediate removal was undertaken, do not possess any extraordinary interest, and are not included here. In most of the following cases (7) the foreign body was a mere accidental finding at autopsy. Cases which correspond most closely to the one herewith recorded are those in which the foreign body produced symptoms during life; these cases are 5 in number. In the cases reported by G. A. Watson (1869) and by Belfrage (1874) no operation was undertaken. In Dalziel's patient (1894) no diagnosis was made, but the foreign body (a darning needle) was removed after enlarging a sinus in the hypochondrium. In the patients whose histories are recorded by Peters (1898) and by Barling (1915) the correct diagnosis was made, in one case (Peters) from the history, and in the other (Barling) by the history confirmed by the x-ray; in both cases the foreign body was removed successfully. In the case of all three patients who survived operation (Dalziel, Peters, Barling) it is apparent that the foreign body entered the liver through the abdominal wall. Yet in all 7 of the cases where the foreign body was found postmortem and did not appear in any way responsible for the patient's death, it had entered the liver through the digestive tract. Perhaps the fatal result in the case of the patient herewith recorded may be attributed to the notoriously septic effect of wounds made by fish-bones, etc.

I. Foreign bodies accidentally found in liver at autopsy:

1. Langwagen, 1857.
2. W. Watson, 1868.
3. Dock, 1894.
4. McConaghey, 1901.
5. Livingstone and Jubb, 1902.
6. Halbron, 1903.
7. Scagliosi, 1904.

II. Foreign bodies in the liver producing symptoms, not treated by operation:

8. G. A. Watson, 1869.

9. Belfrage, 1874.

III. Foreign bodies in the liver, removed by operation:

10. Dalziel, 1894.

11. Peters, 1898.

12. Barling, 1915.

13. Ashhurst and Crossan, 1916.

I.—Cases of foreign body in the liver accidentally discovered at autopsy.

1. Langwagen (*Arch. f. Physiol. Heilkunde*, 1857, n. F., i, 266) found at autopsy on the body of an insane woman, who had been under observation for two weeks before death, a *knitting needle in the liver*. "The liver was in general in a normal condition, except that the left lobe was somewhat atrophic. In the place where the right and left lobes join and form a shallow groove, was seen a white callous scar or cicatrix, which followed the longitudinal course of this groove from behind toward the front. This white cicatrization was three and one-quarter inches long, and two inches wide, very firm, and contained a broken knitting needle, three inches in length, about which this cicatricial tissue was twisted, as it were, and from which it was difficult to be severed. The knitting needle itself was very much covered with rust, after the tissue had been scraped away. Moreover, this knitting needle was then found to be rough and uneven, and only in one small spot was it round and smooth. Almost directly under the knitting needle lay a rather big, yet sound, vein branch. Neither on the outer epigastrium, nor in the stomach, nor on the liver itself, could any previous injury be detected. The relatives of the deceased woman were unable to furnish any information whatsoever in regard to this case."

2. Watson, W. (*Lancet*, London, 1868, ii, 477), at autopsy on a girl, aged eleven and a half years, who had died during an epileptic seizure, found a *pin* in the liver:

"*Abdomen*. Spleen slightly enlarged. Liver natural and healthy, but on raising it I found it was adherent to the stomach, toward the right side; with even and careful manipulations it gave way, and something pricked the index finger of my left hand. On further search I discovered a pin, one and a half inches in length

perforating the stomach; and it was embedded for at least half an inch in the liver, but in the accidental separation it had been withdrawn. A discolored patch the size of a shilling showed where the pin had pricked the stomach several times before the perforation had occurred, the aperture in which, after separation, would have admitted a crow quill. Fortunately, no particles of food were able to escape into the peritoneal cavity."

3. Dock (*University Medical Magazine*, 1888-9, i, 39).

"At a recent autopsy on an adult negro a fibrous, plainly circumscribed tumor the size of a hempseed was found directly under the capsule of the liver. Its appearance suggested syphiloma, though as no others were to be found, fibroma seemed more probable. On making sections it was found to have a capsule 1 mm. in thickness, containing small vessels and many round cells. Inside of this there was a hyaline, non-nucleated structure, showing a fasciculated arrangement like that of a fibrous tumor, and in the center a homogeneous structureless mass. This surrounded a small body, . . . which can be recognized as a vegetable hair, probably from the seed of one of the cereals. The part shown measures 3 mm. in length, having been cut off obliquely at both ends, and the other ends shown in the neighboring sections were probably half as long again.

"The hair is yellow, tubular and the spires so arranged that five form a complete circuit. The fibroma is simply, therefore, a reactive growth around a foreign body. How the hair found its way into the liver, whether by boring its way like a needle or working its way up the biliary canal is difficult to decide. Not enough tissue was taken to show its relation to the biliary canal.

"I am unable to find a single instance of a similar foreign body in the liver."

4. McConaghey (*British Medical Journal*, 1901, i, 271). "A man, aged thirty-seven years, was admitted to the asylum April 11, 1899. His attack of insanity had lasted six years, and at the time of his death was suffering with dementia. He was diagnosed as advanced phthisis, from which he succumbed November 17, 1900.

"*Postmortem.* Both lungs in advanced stage of tuberculosis. In the liver a rusty needle one and a half inches long was found transfixing the center of the left lobe of that organ, the point having taken a course upward and forward. It was embedded in dense fibrous tissue, and there was cicatricial thickening at point of entrance and where it would have emerged. There were no

adhesions, signs of peritonitis or recent mischief. On examining the stomach three small pigmented patches were found near the pyloric opening, the pigment being present in the situation, both on the inside and the outside of the stomach and also extending through the substance of the wall of the stomach.

"The probability is that the patient swallowed the needle some years before, that it passed through the wall of the stomach in the region of the pylorus, and became lodged in the liver substance. Although the needle was protruding both above and below the substance of the organ, it had not given rise to any symptoms during life, and in nowise was it the cause of death."

5. Livingstone and Jubb (*British Med. Jour.*, 1902, ii, 701), at autopsy on a man, aged sixty-four years, who died of carcinoma of the rectum, note that: "In the left lobe of the liver a nail was found which perforated the organ from below upward. The head of the nail was almost flush with the under surface of the liver and was covered by peritoneum. The point was bare and blunt. On the under surface of the liver running transversely was a white elliptical scar, about three inches long, and the head of nail was in the center of the scar.

"On the upper surface of the liver there were two small white scars close to the point of the nail, and the capsule and peritoneum around the point had the same opaque appearance as underneath. It seemed as if the nail had caused a good deal of irritation on the under surface of the liver before entering, and it evidently emerged twice on the upper surface before finally assuming its final position. It may be that the nail was swallowed during a drunken fit (the patient was given to excess) and that becoming jammed in an upright position near the narrows of the pylorus it was gradually pushed through the stomach wall, so that the point scratched the under surface of the liver, due to movement of the stomach. No trace of injury could be found other than those in the liver. The nail is an ordinary carpenter's, one and three-quarter inches in length.

"No complaint other than that due to the cancer was made by the patient, and we are ignorant of the manner in which it reached its remarkable destination.

"Patient was a jockey in his better days."

6. Halbron (*Bull. et mém. Soc. anatomique de Paris*, 1903, lxxviii, 44), at autopsy on a woman who died of pneumonia, found among adhesions holding the transverse colon to the liver a pin with its head under the capsule of the liver. The foreign body probably had been swallowed, had passed through the intestinal wall, and had lodged there, without giving rise to morbid symptoms.

In the discussion of Halbron's report Petit (of Alfort) remarked that he had often, in dogs, encountered needles implanted in the liver, spleen, wall of colon, and omentum. Among ruminants, he added, ingestion of foreign bodies gives rise to grave phenomena, notably to "suppurative pericarditis" (*sic*). Titta (*Gior. d. r. Soc. ed Accad. vet. ital.*, Torino, 1902, li, 1074) collected a number of cases in which foreign bodies had been found in the livers of dogs. Pietri (*Arch. per le sc. med.*, 1916, xxxix, 85) has recently conducted experiments on the lower animals to ascertain the toleration of the liver for foreign bodies.

7. Scagliosi (*Berlin klin. therap. Wchnschr.*, 1904, xi, 1103) found at autopsy on a woman, aged sixty years, a *fish-hook in the liver*. "The liver has decreased slightly in size. Between the liver and the duodenum there are adhesions like connective tissue. . . . The contents of the gall-bladder proved to be almost normal in quantity and color. In the liver at the side of the gall-bladder is to be found, in the fossa longitudinalis dextra, and parallel to the latter, a roundish circumscribed thickening of the Glisson capsule the size of a pigeon's egg. When this thickened capsule spot is cut, a hard insurmountable obstruction is found, which is formed by a foreign body, a fish-hook, rusted on the surface and 32 mm. long." Histological study, with suitable staining methods, showed iron pigment in the liver.

Scagliosi adds the explanation that this woman was the wife of a fisherman; and when her time permitted it she busied herself lacing the hooks to be used by her husband in his business. As is generally known, he explains, it is the custom of the people who are in this business to stick their finger into their mouth to moisten it with saliva so that the silk or horsehair may, in tying, remain caught in the hook better. Evidently, while the woman was at this work she heedlessly swallowed a fish-hook. From that time on she suffered pains in the abdomen, but never ostensibly in the liver.

II.—Cases of foreign body in the liver producing symptoms, not treated by operation.

8. G. A. Watson (*Indian Med. Gaz.*, 1869, iv, 117). A native Indian, male, aged twenty-three years, swallowed a piece of wood which he was using to clean his teeth, tongue, and pharynx, and came to the hospital (July 23, 1868) for dysphagia which soon disappeared, and he was sent home the next day. He was readmitted August 15, with fever and pain in the right hypochondrium. He said this was not due to the piece of wood, which he had 'digested.' Fever, pain, and tenderness over the liver continued,

with tympany of the bowels, until August 28, when he became jaundiced. On September 6, tenderness over the liver was much increased and a distinct hardness and slight swelling were felt. The same day he passed a large quantity of blood from the bowels, and died September 7, forty-six days after swallowing the wood.

Autopsy showed a piece of willow stick six inches long, and one-quarter inch in diameter, one end lodged in the duodenum and one end projecting through into the under surface of liver. The liver was inflamed, and some purulent matter had formed in its substance. There was a large quantity of dark blood in the duodenum and jejunum, but no general peritonitis.

9. Belfrage (*Upsala Läkareförening Förhandlingar*, 1874-1875, x, 150). "L., a laborer, aged fifty-one years, was admitted to the Majornas Hospital, December 29, 1873. He had always been in good health until two weeks before he was admitted to the hospital, when he commenced to suffer from chills, followed by fever and perspiration, which appeared irregularly, sometimes daily, sometimes only every other day, sometimes in the morning, sometimes in the afternoon or at night. He felt well between the attacks, but was very weak. He looked very pale and fatigued when he was admitted, but he had no pain, and he complained only of the above-mentioned chills, which still appeared very irregularly, usually once every twenty-four hours. They were followed by a considerable rise in temperature, which, after much perspiration, generally returned to normal or sometimes below normal. Lungs and heart were in a good condition. The appetite was poor; the bowels moved regularly. Without feeling any spontaneous pains in the epigastrium, he still was very sensitive there, and you could feel, following the configuration of the right 'musculus rectus,' an obstruction, which reached from the lower ribs to the navel. It seemed to be on the outside and could be felt best when he was lying on his back; when in a sitting position, there was no pain felt and it could hardly be noticed. The percussion note or sound at this point was dull; but still it was plainly tympanitic. The liver dulness not enlarged, commenced at the seventh intercostal space and extended to the lower part of the ribs. The splenic dulness was above normal. The urine was free from albumin. The treatment consisted of hot poultices on the obstruction and several full doses of quinine, which, however, had no effect on the chills.

"The obstruction in the wall of the abdomen rose gradually more and more above the surrounding region, and when at last a fluctuation was noticed, an incision was made on January 14, 1874,

when two tablespoonfuls of thick pus was taken out, after which the swelling went down and the sensitiveness decreased. Then, when the chills still continued in irregular intervals after the abscess had been opened, on January 18, arsenic was prescribed, but without any result.

"In the beginning of February he was taken dangerously ill with double pneumonia, from which he fully recovered, although his convalescence was very slow. As soon as he was taken down with pneumonia, the chills disappeared and did not return. During the latter half of March he greatly improved; he had a fine appetite and seemed to get better day by day. From the incision in the abdomen, which was kept open, a thin pus drained continually, and he often complained of stinging pains there.

"On April 4 he was once more seized with chills, which developed into pneumonia in the right side, and he died on April 8.

"At the *postmortem examination* of the body it was discovered that the entire right lung, with the exception of the anterior edge, was the seat of a cryptogenic inflammation; the upper lobe showed gray hepatization, the two lower, red. The wall of the abdomen, corresponding to the incision, was united to the upper part of the liver, between the ligamentum suspensorium and the gall-bladder, by a strong, rope-like string as thick as a finger. During the manipulation for the removal of the liver, there appeared in the incision a dark brown, pointed body which, after it had been taken out, proved to be a pine-like straw, more than two inches long, probably a vegetable fiber. On closer examination of the abscess, it was discovered that it continued from the outside of the liver into the substance itself, where, in the form of a narrow passage, it could be followed about two inches in the direction from above and from downward and backward to the lower part of the liver, which, as far as could be ascertained, was not reached by the passage of the abscess. The liver was otherwise normal in size, consistency and blood contents. The spleen was considerably enlarged and of a solid consistency; its capsule was too thick and wrinkled; the incision, a reddish brown, showed a large quantity of germs. The other organs were in a healthy condition.

"There is no doubt that the man, who, according to his wife, was a voracious eater, at some time or another had swallowed the straw, which later on had worked its way through the intestines, perhaps along the ligamentum hepatoduodenale and eaten its way into the liver, and now, after it had attached itself to the wall of the abdomen, was about to be eliminated from the body."

III.—Cases of foreign body in the liver removed by operation.

10. T. K. Dalziel (*Glasgow Medical Journal*, 1894, xlii, 457).
 “W. G., aged five months, brought to the Sick Children’s Dispensary October 20, 1894, with a sinus at the right hypochondrium which, according to the mother, had existed for two months and for which she knew no cause. Examined by Dr. Nicoll, the sinus was found to pass in the direction of the gall-bladder and at a depth of two inches the probe struck against something hard. The child was sent to the hospital the same day.

“Under CHCl_3 Dr. Dalziel enlarged the opening and on breaking down the adhesions the gall-bladder and general peritoneal cavity came into view. Further manipulation revealed a small opening on the surface of the right lobe of the liver up under the costal margin, and finally, after some difficulty, a darning needle three and one-quarter inches long was drawn out. It lay horizontally and the point was inward and to the left. The wound was partly stitched and stuffed with iodoform gauze.

“Recovered. Discharged on October 22.”

11. Peters (*Canadian Practitioner*, 1898, xxiii, 656). “The patient was a child, aged eleven months, under the care of Dr. Sheehan, of St. Catherines. On Tuesday evening, October 25, 1898, the mother was fondling the child and pressing him to her breast, when he suddenly cried out with pain and continued screaming for some time. The mother did not know at the time what the cause of the pain was, but afterward remembered that she had had a needle in her bodice and then discovered that it was absent. A few hours later the grandmother noticed, on dressing the child, that there was a spot upon the underclothing just over the region of the liver, and also a small red, punctiform discoloration over the region of the right rectus muscle, near the middle line. It was then surmised that the needle had entered through the wound. Next day the child was shown to Dr. Sheehan, who could feel indistinctly the end of the needle through the right rectus muscle. He brought the child over to St. Michael’s Hospital and placed him under my care. At the time of admission the liver moved up and down with each respiration, and a short way from the punctiform wound of the skin a somewhat pointed body could be felt, which seemed to be tilted at each respiratory movement. With Dr. Sheehan’s assistance I cut down upon this on Thursday, October 27, two days after the needle had entered. On cutting through the skin and muscle a small amount of edema was found in the deeper layer of the sheath of the right rectus muscle, but

diligent search failed to discover the needle, either to the eye or to the touch. The peritoneum was accordingly opened, and at a point just above where the opening was made an adhesion was discovered binding the liver to the abdominal wall and preventing free movement in respiration. Without disturbing this adhesion the dissection was continued down through it, and the needle was found almost buried in the liver, but with its eye just within the sheath of the right rectus muscle. The needle pointed in a direction backward, upward and to the right, and was buried in the liver with the exception of the extreme butt end, as above mentioned. It was removed readily and found to be black in color, but smooth. The wound was stitched up without drainage, healed by first intention, and the child left the hospital on the sixth day. The needle was an ordinary sewing needle, one and a half inches long."

12. Barling (*Arch. Roentgen Ray*, 1915, xix, 25). Piece of glass bottle in liver for twenty-three years; removed successfully by laparotomy. "In September, 1911, a healthy married woman, aged twenty-six years, came to the out-patient department at the General Hospital, Birmingham, complaining of pain shooting down the right side of the abdomen into the groin. Pain was intermittent, had been present off and on for one year, and was accompanied by some tenderness in the right iliac fossa. Examination of the urine negative. X-ray of the kidney and ureter negative. Diagnosis: chronic appendicitis. At a subsequent operation a long appendix, somewhat kinked at its root was removed. This was considered sufficient to account for the patient's symptoms.

"The patient again presented herself in October, 1913. She still complained of the old pain, which had been little, if at all, relieved by the operation. It now seemed higher up, near the costal margin; and was distinctly worse when she was active.

"On close questioning as to the past history, it was ascertained that twenty-three years ago she was carrying a bottle of beer upstairs and she stumbled and fell, cutting herself just over the lower margin of the chest. She was very ill after this and was confined to her bed for nearly six months. On examination a scar was found three inches long, exactly parallel to the interval between the sixth and seventh ribs on the right side. This had been previously overlooked owing to a pendulous breast.

"Another radiograph was taken, somewhat higher than on the previous occasion. This revealed an opaque body about three inches by one inch, lying across the tenth and eleventh ribs, just external to the upper end of the right kidney. It had just been

missed by the first x-ray, which included the kidney area alone. As a lateral view could not be taken, it was difficult to ascertain the exact depth of the body. An incision was therefore first made in the subcutaneous and muscular tissues of the lower part of the thorax posteriorly. Nothing, however, could be detected there. The abdomen was then opened through the right semilunaris, just below the costal margin. On introducing the hand into the right diaphragmatic space, it was found that a large mass of adhesions filled the interval between the diaphragm and the right lobe of the liver. Good access was given to this region by cutting through the rectus muscles. When the adhesions were broken down a large cyst with white, fibrous walls was found, partly in the subdiaphragmatic space and partly in the substance of the liver. When this was punctured, a large amount of dark fluid escaped and a freer opening yielded something more than a pint of this fluid, dark in color, and evidently a residue of an old hemorrhage. Deep in the cyst was an old fibrous blood clot in which some sharp-edged foreign body could be felt and which cut the gloved hand when attempts were made to dislodge it. Eventually a piece of thick green bottle was removed, measuring two and a half by one and a half inches, and triangular in shape. It was curved and was evidently a portion of an ordinary bottle, the edges and corners being as sharp as recently fractured glass.

"Cyst packed with gauze, as the hemorrhage was free, drainage tube stitched in the wound.

"Recovered. Left the hospital in three weeks. Still a sinus discharging a slight amount of pus but this is gradually closing."

INVERSION OF UTERUS REDUCED BY LAPAROTOMY; RECOVERY

BY EDWARD T. CROSSAN, M.D.
RESIDENT PHYSICIAN IN THE HOSPITAL

H. E., aged twenty-three years, does housework. Admitted March 27, 1916, to Dr. Mutschler's service.

Family History. Negative.

Personal History. Married two years. No previous illness.

History of Present Illness. Five days ago gave birth to her second child, which according to her calculations was premature by one month. Labor was easy but the placenta was retained for about one-half hour, at the expiration of which time she was directed by the physician in attendance to bear down with her clenched fists placed above the pubis, and she states that the doctor did not assist in any manner. After following the physician's directions, she felt something give way and she had a profuse hemorrhage; since that time and up until admission has bled considerably. Has not had any pain, fever, chills or sweats.

Condition on Admission. Temperature, 99.3° F. Pulse, 100. Respirations, 22. Patient is an adult female, markedly pallid and seems talkative and restless. Hemoglobin, 36. Red blood cells, 1,880,000.

Head. All the mucous membranes show a marked pallor.

Neck. Normal.

Chest. Well formed.

Lungs. Note at both apices impaired, with prolonged expiration, more marked on the right side. No rales.

Heart. Hemic murmur at pulmonary area. Sounds normal elsewhere.

Abdomen. No areas of tenderness, no masses.

Pelvis. Floor good. There is a mass filling the vaginal cavity, rounded, with the apex above, bleeding freely on the slightest

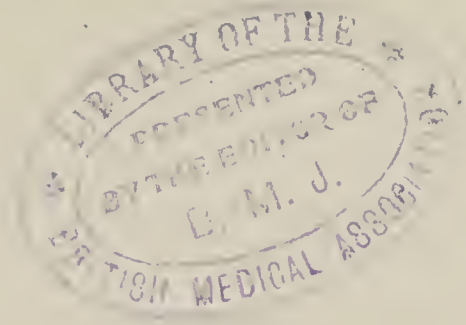
irritation. Cervix of the uterus not palpable, the fundus also not palpable above the pubis.

March 29. Since admission the patient has bled continuously from the genital tract. Operated on today.

Operation (Dr. Mutschler). Attempts were made to replace the uterus, by pressure exerted upward on the fundus through the vagina, but they were unsuccessful. An incision four inches long was then made through the anterior abdominal wall, terminating just above the symphysis, and fruitless attempts were made to replace the uterus by traction on the round ligaments. It was finally replaced by upward traction on the round ligaments, downward pressure on the sides of the uterus, combined with force exerted upward on the fundus through the vagina. Abdomen closed in layers.

April 8. Since operation temperature has ranged around 100.1° . There has been no bleeding, no pain in abdomen, nor any tenderness. Hemoglobin, 54. Red blood cells, 3,020,000.

April 18. Discharged. Hemoglobin, 60. Red blood cells, 3,000,000. This patient was seen one month later and is in perfect health.



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